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ATLANTIC OCEANOGRAPHY.

VOLUME II,

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Principal Investigators;
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Other Sources of Support

Report

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January 1, 1978 to December 31, 1978

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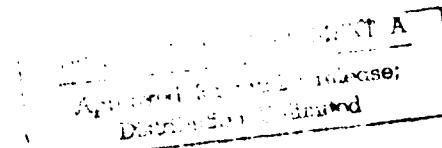
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Volume I contains the 1979 proposal, budgets and the 1978 annual report. This volume contains supplementary information such as: vita, publications and other sources of support.

Institution Facilities

There is available at the Institution for the accomplishment of sponsored research, a wide range of plant and seagoing facilities which can provide a significant capability in support of a prospective investigator. These include:

Research Vessels

- R/V KNORR - A 245-foot Navy owned modern research ship constructed in 1970 for multi-disciplinary investigations. Designed for carrying 25 scientists on worldwide cruises, it has highly capable maneuvering ability due to its cycloidal propulsion.
- R/V ATLANTIS II - A 210-foot Institution owned vessel built in 1963 for multi-disciplinary research. Carries 25 scientists and has excellent laboratory space.
- R/V OCEANUS - A 180-foot ship built in 1975 by the National Science Foundation. For twelve scientists this ship has excellent working spaces, high speed and economical operation.
- R/V ASTERIAS - A 40-foot vessel for day trips and testing equipment.

Shops

- Instrument Shop - This is a unique facility capable of manufacturing precision machine parts and instruments of specialized design.
- Mechanical Shop - For machinery and engine maintenance and repairs: welding, staging and metal fabrication. Cranes and heavy machinery are maintained here.
- Marine Electronics Shop - Along with the general electronics shop for the maintenance and repair of shipboard electronics and instruments, specialized electronics shops are operated by the Ocean Engineering Department and within several project centers.

- Other Shops - include carpentry, electrical and fiberglass for the maintenance of Institution facilities and fabrication of specialized research equipment.
- Stockroom - A wide range of supplies and tools are available to investigators and employees at the Institution Stockrooms.

Graphics

- Photo Lab - Photographic services including specialized processing are available in both black and white and color.
- Drafting - Engineering drawing and scientific art work are available for specialized descriptions and the preparation of reports.
- Reproduction - Offset Xerox and Ozalid services are routinely available.

Specialized Research Facilities

The Institution operates on a cost-center or other use charge basis, specialized facilities for laboratory testing and analysis. These include:

- Electron Microscope
- Mass Spectrometer
- X-ray Fluorescence Spectrometer
- Nutrient Chemistry Facility
- Pressure and Temperature testing Facility
- Reversing Thermometer Calibration Facility
- Flume Tank

Computing Facilities

- Sigma-7 - Central processing system.
- Hewlitt-Packard RTE mini-computer systems are installed on each vessel for shipboard computer services.
- VAX - 11 - System for scientific use will be operational by the end of 1978.

Library

The Institution jointly with the Marine Biological Laboratory operates the MBL Library which is a major facility housing 150,000 volumes. In addition, the Institution operates a document library specializing in oceanographic reprints and documents. The Institution Librarian is available for services with other libraries.

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77-53 Robert G. Walden, Clayton W. Collins, Jr., Peter R. Clay and Patrick O'Malley. Validation testing of the DOCMS intermediate mooring. Sep 77. 56 p. (AD-A047 984)

77-54 Bryce Prindle. Improved fishbite armor for deep-sea mooring lines. Aug 77. 33 p. (AD-A046 066)

77-55 Lincoln Baxter II. MSS-FVT acodac data assessment and ambient noise third octave data processing(U). Jun 78. 70 p. (Confidential)

77-56 S. Tarbell and A. W. Whitlatch. A compilation of moored current data and associated oceanographic observations Volume XV (1971 measurements). Sep 77. 242 p. (AD-A045 525)

77-58 William A. Watkins and William E. Schevill. The development and testing of a radio whale tag. Sep 77. 38 p. (AD-A044 807)

77-60 Clifford L. Winget. Final report - description and test of a fishing trawl and net resistant bottom mounted current meter, with diverless surface deployment and recovery capabilities. Nov 77. 121 p.

77-61 Arthur R. Miller. Ranges and extremes of the natural environment related to design criteria for ocean thermal energy conversion plants. Oct 77. 73 p.

77-64 George Veronis and Mary C. Thayer. Notes on the 1977 Summer Study Program in Geophysical Fluid Dynamics at the Woods Hole Oceanographic Institution. Dec 77. 254 p. (AD-A051 625)

77-68 Barry Raymond Ruddick. Observations of interaction between the internal wavefield and low frequency flows in the north Atlantic. Nov 77. 334 p. (AD-A047 093)

77-70 David A. Johnson and Alexander N. Shor. Initial cruise report, ATLANTIS II-94, leg 1. Dec 77. 57 p. (AD-A048 724)

77-74 Hartley Hoskins, Stephen R. Gegg and Christopher R. Tapscott. Cruise data report, R/V ATLANTIS II-93, legs 5 and 6, Central Indian Ocean Triple-Junction. Dec 77. 55 p. (AD-A050 421)

78-1 Jean King Whelan. Amino acids in a surface sediment core of the Atlantic abyssal plain. Apr 78. WHOI Contribution No. 3837: Geochimica et Cosmochimica Acta 41: 803-810 (1977). (AD-A052 015)

78-2 Laurence Armi. The dynamics of the bottom boundary layer of the deep ocean. Apr 78. WHOI Contribution No. 3857: Proceedings of the 8th International Colloquium on Ocean Hydrodynamics: 153-164 (1977). (AD-A052 016)

WHOI
78-3

William J. Schmitz, Jr. On the deep general circulation in the western North Atlantic. Apr 78. WHOI Contribution No. 3779: Journal of Marine Research 35(1): 21-28 (1977).

78-4

Albert J. Williams 3rd and John S. Tochko. An acoustic sensor of velocity for benthic boundary layer studies. Apr 78. WHOI Contribution No. 3843: Proceedings of the 8th International Colloquium on Ocean Hydrodynamics: 83-97 (1977). (AD-A052 066)

78-5

Susan Tarbell and Ann Spencer. A compilation of moored current data and associated observations (mode-site, vol. XVI 1971-1975). Mar 78. 48 p.

78-7

Edward P. Laine. Geological effects of the Gulf Stream in the North American Basin. Jan 78. 165 p. (AD-A049 557)

78-8

Bruce A. Warren. Shapes of deep density-depth curves. Apr 78. WHOI Contribution No. 3871: Journal of Physical Oceanography 7(3): 338-344 (May 1977). (AD-A052 502)

78-9

Bruce A. Warren. Deep western boundary current in the eastern Indian Ocean. Apr 78. WHOI Contribution No. 3854: Science 196: 53-54 (1 April 1977). (AD-A052 501)

78-11

Rory O.R.Y. Thompson. Observations of rossby waves near site D. Apr 78. WHOI Contribution No. 3678: Progress in Oceanography 7: 135-162 (1977). (AD-A052 018)

*78-12

Peter M. Saunders. Wind stress on the ocean over the eastern Continental Shelf of North America. Apr 78. WHOI Contribution No. 3880: Journal of Physical Oceanography 7(4): 555-566 (July 1977).

78-13

Cindy Lee, Robert G. Gagosian and John W. Farrington. Sterol diagenesis in recent sediments from Buzzards Bay, Massachusetts. Apr 78. WHOI Contribution No. 3875: Geochimica et Cosmochimica Acta 41: 985-992 (1977). (AD-A052 853)

78-14

L. V. Worthington. The case for near-zero production of Antarctic bottom water. Apr 78. WHOI Contribution No. 3280: Geochimica et Cosmochimica Acta 41: 1001-1006 (1977). (AD-A052 854)

78-15

Robert C. Spindel, Robert P. Porter and Douglas C. Webb. A mobile coherent low-frequency acoustic range. Apr 78. WHOI Contribution No. 3901: IEE Journal of Oceanic Engineering OE-2(4): 331-337 (October 1977). (AD-A052 855)

78-16

John D. Milliman. Dissolution of calcium carbonate in the Sargasso Sea (northwest Atlantic). Apr 78. WHOI Contribution No. 3777: The Fate of Fossil Fuel CO₂ in the Oceans: 641-653. (AD-A052 856)

*78-17

John D. Milliman and Jens Müller. Characteristics and genesis of shallow-water and deep-sea limestones. Apr 78. WHOI Contribution No. 3775: The Fate of Fossil Fuel CO₂ in the Oceans: 655-672.

WHOI

*78-18 John D. Milliman. Late quaternary sedimentation on Atlantic continental margins and the deep sea. Apr 78. WHOI Contribution No. 3689: Anais da Academia Brasileira de Ciencias 48(Suplemento): (1976).

*78-19 John A. Whitehead, Jr. and David L. Porter. Axisymmetric critical withdrawal of a rotating fluid. Apr 78. WHOI Contribution No. 3689: Dynamics of Atmospheres and Oceans 2: 1-18 (1977).

*78-21 Harry L. Bryden. Geostrophic comparisons from moored measurements of current and temperature during the mid-ocean dynamics experiment. Apr 78. WHOI Contribution No. 3727: Deep-Sea Research 24: 667-681 (1977).

*78-22 Max Blumer, Walter Blumer and Theodore Reich. Polycyclic aromatic hydrocarbons in soils of a mountain valley: correlation with highway traffic and cancer incidence. Apr 78. WHOI Contribution No. 3693: Environmental Science & Technology 11(12): 1082-1084 (November 1977).

78-23 N. L. Brown and G. K. Morrison. W.H.O.I./Brown conductivity, temperature, and depth microprofiler. Feb 78. 246 p. (AD-A052 054)

78-24 S. T. Knott, Frederick R. Hess, Warren E. Witzell and Earl M. Young. Ping-through-the-hull 3.5 kHz echo-sounding systems on the research vessels CHAIN, ATLANTIS II, and KNORR. Feb 78. 14 p. (AD-A051 680)

78-27 Alain Colin de Verdiere. Quasigeostrophic flows and turbulence in a rotating homogeneous fluid. Mar 78. 174 p. (AD-A052 024)

*78-29 John W. Farrington, Nelson M. Frew, Philip M. Gschwend and Bruce W. Tripp. Hydrocarbons in cores of northwestern Atlantic coastal and Continental Margin sediments. Apr 78. WHOI Contribution No. 3817: Estuarine and Coastal Marine Science 5: 793-808 (1977).

*78-30 John W. Farrington and Bruce W. Tripp. Hydrocarbons in western North Atlantic surface sediments. Apr 78. WHOI Contribution No. 3894: Geochimica et Cosmochimica Acta 41: 1627-1641 (1977).

*78-34 Robert C. Groman and Jane A. Dunworth. Cruise data report, R/V ATLANTIS II 93, leg 7. May 78. 26 p.

*78-41 Laurence Armi. The importance of boundaries. May 78. Oceanus 21(1): 14-19 (Winter 1978).

*These reports have not yet been issued.

TECHNICAL MEMORANDUMS
1 September 1977 to 1 September 1978

WHOI

3-77 David S. Hosom. A low cost adaptable heading hold system for ALVIN. Oct 77. 13 p.

1-78 David S. Hosom. A pulsed light command system for the scamp platform and ALVIN. Feb 78. 21 p.

Statement on Data Dissemination

In accordance with OCEANAV INSTRUCTION 3161.4A as of December 12, 1973,

1. First-Level Inventory

All efforts are made to see that data dissemination is carried out within the time frame prescribed for new data reporting. The inventory and reporting of scientific cruises using the R.O.S.C.O.P. Form are usually made within the 30 days allowed.

2. Second-Level Inventory

This type of inventory pertains mostly to bottom camera stations, core descriptions and sea floor samples. This is done as needed in cooperation with the Federal Collecting Agency.

3. Third-Level Inventory

Oceanographic and environmental data such as bathymetry, coravity, seismic and magnetics along with the ships navigation are sent as directed to N.G.S.D.C. within one year.

They are usually sent on digital magnetic tape except for seismics which are sent on 35mm film and has the navigation included.

I. BIOLOGY

VOLUME II

DEPARTMENT OF BIOLOGY

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1. MICROBIAL TRANSFORMATIONS IN THE DEEP SEA BENTHIC BOUNDARY LAYER

Holger W. Jannasch

Carl O. Wirsén

PII Redacted

Craig D. Taylor

Holger W. Jannasch - Ph.D., University of Göttingen, Germany, 1955; Assistant Scientist, Hydrobiological Institute of the Max-Planck-Society, Plön, 1956-59; on leave: Research Fellow, 1957-58, Scripps Institution of Oceanography, La Jolla, Calif., and Hopkins Marine Station, Pacific Grove, Calif.; Project Associate, 1958-59, Department of Bacteriology, University of Wisconsin, Madison, Wisconsin; Assistant Professor, 1950-63, Department of Microbiology, University of Göttingen; Senior Scientist, 1963 to present, Woods Hole Oceanographic Institution; ONR consultant 1967-70; Director of Marine Ecology Course, 1970-74, and of a Research Training Program in Microbial Ecology, 1974 to present, Marine Biological Laboratory, Woods Hole; Editorial Board of 4 professional journals: co-editor of ADVANCES IN AQUATIC MICROBIOLOGY: author or co-author of 80 publications in ecological and physiological microbiology.

Carl O. Wirsén - B.S., University of Massachusetts, 1964; M.A., Boston University, 1966; Research Associate, 1966-68, Harvard University Division of Engineering and Applied Physics, Laboratory of Applied Microbiology; Research Associate, September 1968 to 1976; Research Specialist, 1976 to present, Biology Department, Woods Hole Oceanographic Institution. Author or co-author of 14 publications in marine microbiology.

Craig D. Taylor - B.S. in Biology, Portland State University, 1967; M.S. in Biology, Portland University, 1969; M.S. in Microbiology, University of Illinois (Urbana), 1971; Ph.D. in Microbiology, University of Illinois, 1973; Postdoctoral Investigator, 1973-74 and Assistant Scientist, 1974-78, Woods Hole Oceanographic Institution. Author or co-author of 12 publications in biochemistry and microbiology.

Publications 1976-1978

1976 Jannasch, H.W., C.O. Wirsén and C.D. Taylor. Undecomposed microbial populations from the deep-sea. *Appl. Environ. Microbiol.* 32: 360-367.

1976 Taylor, C.D. Structure and methylation of a new cofactor (co-enzyme M) in methyl-transfer reactions. In H. G. Schlegel, G. Gottschalk and N. Pfennig [eds.], *Microbial Formation and Utilization of Gases (H₂, CH₄, CO)*. Goltze, Göttingen. pp. 181-190.

1976 Taylor, C.D. and H.W. Jannasch. A subsampling technique for measuring growth of bacterial cultures under high hydrostatic pressure. *Appl. Environ. Microbiol.* 32: 355-360.

1976 Taylor, C.D. and H.W. Jannasch. Activity of bacteria at high pressure in an oxy-helium atmosphere. Am. Soc. Microbiol., 76th Ann. Meetg., Atlantic City, 1976. p. 177, N 42 (Abstract).

1976 Tuttle, J.H. and H.W. Jannasch. Microbial utilization of thiosulfate in the deep-sea. Limnol. Oceanogr. 21: 697-701.

1976 Wirsén, C.O. and H.W. Jannasch. The decomposition of solid organic materials in the deep-sea. Environ. Sci. Technol. 10: 880-887.

1977 Jannasch, H.W. Growth Kinetics of aquatic bacteria. In: Aquatic Microbiology, S.A.B. Symposium Series No. 6, J.M. Shewan and F.A. Skinner [eds.], Academic Press, London 1977, p. 55-68.

1977 Jannasch, H.W. and C.O. Wirsén. Retrieval of concentrated and undecompressed microbial populations from the deep sea. Appl. Environ. Microbiol. 33: 642-646.

1977 Jannasch, H.W. and C.O. Wirsén. Microbial life in the deep sea. Scientific American 236: 42-52.

1977 Rudd, J.W.M. and C.D. Taylor. Methane cycling in aquatic environments. In Droege, M.R. and H.W. Jannasch [eds.], Advances in Aquatic Microbiology. In press.

1977 Taylor, C.D. Growth of a bacterium under a high pressure oxyhelium atmosphere. Appl. Environ. Microbiol. Submitted for publication.

1978 Jannasch, H.W. Microorganisms and their aquatic habitat. In: Environmental Biogeochemistry and Geomicrobiology. W.E. Krumbein [ed.], Ann Arbor Science Publ., Vol. 1: 17-24.

1978 Jannasch, H.W. Experiments in deep sea microbiology, Oceanus 21: 50-57.

1978 Jannasch, H.W. The ultimate sink. In: Microbial Degradation of Pollutants in Marine Environments. A. Bourquin and H. Pritchard [eds.] (in press).

1978 Taylor, C.D. The effect of pressure upon the solubility of oxygen in water. Implications of the deviation from the Ideal Gas Law upon measurements of fluorescence quenching. Biochemistry. Submitted for publication.

1978 Taylor, C.D. Solubility of oxygen in a seawater medium which is in equilibrium with a high pressure oxy-helium atmosphere. Deep-Sea Research. Submitted for publication.

1978 Tuttle, J.H. and H.W. Jannasch. Thiosulfate stimulation of microbial dark assimilation of carbon dioxide in shallow marine waters. Microb. Ecol. 4: 9-25.

1978 Tuttle, J.H. and H.W. Jannasch. Microbial dark assimilation of CO₂ in the Cariaco Trench. Limnol. Oceanogr. (in press).

1978 Wirsén, C.O. and H.W. Jannasch. Physiological and morphological observations on Thiovulum sp. Appl. Envir. Microbiol. (in press).

Current and Pending Support

The three co-investigators are currently supported by the National Science Foundation Grant OCE77-19766 "Microbial Transformations in Seawater", Oct. 1, 1977-Sept. 30, 1978, \$164,300 (salary months: H. Jannasch 9, C. Wirsén 11 and C. Taylor 5). Renewal of this grant for a second year, ending Sept. 30, 1979, is pending. H. Jannasch and C. Taylor also receive 1.2 to 1.5 months support per calendar year through the Educational Program of the Woods Hole Oceanographic Institution. A pending proposal to the National Science Foundation entitled "Growth and Metabolism of Bacteria under High Pressure" by C. Taylor requests 7 salary months for him. Another pending proposal "Microbial Transformations of Organic Compounds in the Marine Environment" Craig D. Taylor and Robert Gagosian Coprincipal Investigators requests a total of 8 man months for Taylor for the period October 1, 1978 through September 31, 1978, \$147,749. This is pending in the Marine Chemistry Program.

2. PELAGIC DEVELOPMENT AND SETTLEMENT BY LARVAE
OF MARINE FOULING ORGANISMS

Rudolf S. Scheltema

[PII Redacted]

Significant Publications for the Past Two Years

1977. Scheltema, R. S. Dispersal of marine invertebrate organisms: Paleobiogeographic and biostratigraphic implications, p. 73-108. In *Concepts and Methods of Biostratigraphy*, E. G. Kauffman and J. E. Hazel [eds.], Dowden, Hutchinson and Ross, Inc., Stroudsberg, Penna.

1977. Scheltema, R. S. Dispersal of pelagic larvae and the zoogeography of tertiary marine benthic gastropods. In *Historical Biogeography, Plate Tectonics and the Changing Environment*, A. J. Boucot and J. Gray [eds.], *Proceedings of the Biology Colloquium at Oregon State Univ.*, Oregon State University Press, Corvallis.

In press. Scheltema, R. S. On the relationship between dispersal of pelagic veliger larvae and the evolution of marine prosobranch gastropods. In *Marine Organisms: Genetics, Ecology, and Evolution*, J. A. Beardmore and B. Battaglia [eds.], *NATO Conference Series (IV - Marine Sciences)*. Plenum Press, New York.

Submitted for publication. Thiriot-Quievreux, C. and R. S. Scheltema. Pelagic larvae of New England gastropods. *V. Bittium alternatum, Triphora nigrocincta, Cerithiopsis greeni, Cerithiopsis emersoni, Lunatia heros, and Crepidula plana*. *Malacologia*.

Curriculum Vitae

RUDOLF S. SCHELTEMA
Biologist
Associate Scientist
Woods Hole Oceanographic Institution

B.S., The George Washington University, 1951
M.S., The George Washington University, 1954
Harvard University, 1954-56
Ph.D., University of North Carolina, 1960

Assistant, 1947-51, The George Washington University
Marine Biologist, 1951-54, Chesapeake Biological Laboratory

Assistant, 1955-56 (summers only), Marine Biological Laboratory
Summer Research Fellow, 1956-58, Woods Hole Oceanographic
Institution
Research Associate, 1959-60, Oyster Research Laboratory,
Rutgers University
Faculty Member, 1961-62, Cape Cod Community College
Research Associate, 1960-63; Assistant Scientist, 1963-67;
Associate Scientist, 1967-present, Woods Hole Oceanographic Institution
Associate Editor: Proceedings National Shellfish Association,
1966-68
Senior Fulbright-Hays Scholar, 1977-78, James Cook University
of North Queensland, Australia

Member: Sigma Xi, American Society of Zoologists, American
Society of Limnology and Oceanography, American Society
of Systematics, American Society of Naturalists

ALISON STONE AMENT
Postdoctoral Investigator
Woods Hole Oceanographic Institution
Born: December 7, 1948

A.B., Magna cum laude, Connecticut College, 1970
Ph.D., University of Pennsylvania, 1978

Research Assistant, 1970-71, University of Pennsylvania
Teaching Fellow, 1971-73, University of Pennsylvania
Guest Lecturer, 1974-75, Massasoit College
Postdoctoral Investigator, 1978, Woods Hole Oceanographic
Institution

Phi Beta Kappa, Delta of Connecticut Chapter, 1970
Honors in Zoology, Connecticut College, 1970
Honorable Mention, NSF Graduate Fellowships 1971, 1972
MacFarlane Fellowship, Biology Department, University of
Pennsylvania, 1972 (for MBL Ecology Course)
Sigma Xi Grant-in-aid of Research, 1973-1974
NSF Doctoral Dissertation Grant, 1975-1978

Member: AAAS, Society for the Study of Evolution, American
Society of Zoologists

Publications

1978 Ament, Alison Stone. Geographic variation in relation to life
history in three species of the marine gastropod genus *Crepidula*.
Ph.D. thesis, University of Pennsylvania.

Ament, Alison Stone. Geographic variation in relation to life history in three species of the marine gastropod genus *Crepidula*: growth rates of newly hatched larvae and juveniles. In: Stancyk, S. E. [ed.], Reproductive Ecology of Marine Invertebrates. Belle Baruch Library in Marine Science, Vol. 9. Univ. South Carolina Press. (In press).

Current and Pending Support

In addition to ONR funding, Rudolf Scheltema is currently supported by a grant from the National Science Foundation OCE73-99439 A02 'Dispersal of the Pelagic Larvae of Benthic Species Over Long Distances: Zoogeographic and Systematic Implications', August 15, 1973 to March 31, 1979 - \$169,600 for 29 man months. Alison Stone Ament is currently supported by ONR contract No. N00014-74-C0262 NR 083-004.

3. THE ENERGY BUDGET OF MARINE WOOD-BORING MOLLUSCS.

Roger Mann

PII Redacted

Significant Publications:

1972 Mann, R. The occurrence of *Mytilicola intestinalis* in three Norfolk populations of the mussel *Mytilus edulis* L. Proc. Norfolk - Naturalists Society.

1975 Walne, P. R. and R. Mann. Growth and biochemical composition in *Ostrea edulis* and *Crassostrea gigas*. Proc. Ninth Europ. Mar. biol. Symp. pp. 587-607. H. Barnes (ed.) Aberdeen Univ. Press.

1977 Mann, R. An assessment of the use of pigment content as a feeding index in oysters. Aquaculture 10: 373-376.

1977 Mann, R. and J. H. Ryther. Growth of six species of bivalve molluscs in a waste-recycling aquaculture system. Aquaculture 11: 231-245.

1978 Mann, R. and S. J. Glomb. The effect of temperature on growth and ammonia excretion of the Manila clam *Tapes japonica*. Estuarine and Coastal Marine Science 6: 335-337.

1978 Mann, R. Growth of *Mytilus edulis* L. in a waste-recycling aquaculture system. Aquaculture 13: 351-354.

In Press

Mann, R. A comparison of morphometric, biochemical and physiological indices of condition in marine bivalve molluscs. In: Energy and Environmental Stress in Aquatic Systems. J. H. Thorp and J. W. Gibbons (eds.) D.O.E. Symposium Series (Conf. - 771114).

Mann, R. Some biochemical and physiological aspects of growth and gametogenesis in *Crassostrea gigas* (Thunberg) and *Ostrea edulis* L. grown at sustained elevated temperatures. J. Mar. Biol. Ass. U.K.

Submitted for Publication

Mann, R. The effect of temperature on growth, physiology and gametogenesis in the Manila clam *Tapes philippinarum* (Adams and Reeve, 1850). J. Exp. Mar. Biol. Ecol.

Curriculum Vitae

ROGER MANN
Assistant Scientist
Woods Hole Oceanographic Institution

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B.Sc., University of East Anglia, Norwich, England; 1972
Ph.D., Marine Science Laboratories, Menai Bridge, University
of Wales; 1976

Fisheries Trainee Fellow, Fisheries Experiment Station, Conwy,
Wales; 1969-1972.

Noyes Postdoctoral Fellow, Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts; 1975-1977.

Assistant Scientist, Woods Hole Oceanographic Institution, Woods
Hole, Massachusetts; 1977-present.

Current and Pending Support

Roger Mann has support from NOAA, Office of Sea Grant for two projects in the period July 1, 1978 - June 30, 1979: "The Biology of the Ocean Quahog, *Arctica islandica*" 1.0 man months, \$20,000 and "A Combined Biological and Economic Analysis of the Feasibility of Large Scale, Waste Recycling Marine Bivalve Aquaculture Systems" (with the University of Massachusetts) 3.0 man months \$25,100. Concurrent with the Ocean Quahog project, 4.0 man months will be supported by the Applied Oceanography Program of W.H.O.I. \$20,000. For the period April 1, 1978 - December 31, 1978: "Biological and Legal Aspects of the Introduction of Exotic Species for Mariculture" a symposium. 2.0 man months, from Pew Foundation through the Marine Policy and Ocean Management Program of W.H.O.I. \$18,400.

Pending proposals are before the Brookhaven National Laboratory (original contract from the Food and Drug Administration) "The Effect of Temperature, pH and Organic Content on the Survival of Human Enteric Viruses in Marine Waters and Sediments", \$48,000, November 1, 1978 - October 31, 1981, total 1.5 man months. National Institutes of Health, John H. Ryther, Principal Investigator; "Technology Development for Rearing Marine Organisms" April 1, 1979 - March 31, 1982, \$483,806, 18 man months, total.

4. Natural Operating Areas
Richard H. Backus

See Volume II GULF STREAM RINGS GSR-29

6. MARINE BIOLOGICAL SOUNDS

William A. Watkins

[PII Redacted]

William E. Schevill

Significant publications for the past two years

1977 Watkins, W. A. and W. E. Schevill. Spatial distribution of *Physeter catodon* (Sperm whales) underwater. Deep-Sea Research 24: 693-699.

1977 Watkins, W. A. and G. C. Ray. Underwater sounds from ribbon seals, *Phoca (Histriophoca) fasciata*. Fishery Bulletin 75(2): 450-453.

1977 Watkins, W. A., W. E. Schevill and P. B. Best. Underwater sounds of *Cephalorhynchus heavisidii* (Mammalia:Cetacea). Journal of Mammalogy 58(3): 316-320.

1977 Watkins, W. A. Acoustic behavior of sperm whales. Oceanus 20(2): 50-58.

1977 Watkins, W. A. and W. E. Schevill. The development and testing of a radio whale tag. WHOI Ref. 77-58. Woods Hole Oceanographic Institution, Woods Hole, MA, 38 pp.

1977 Watkins, W. A. and W. E. Schevill. Sperm whale codas. Journal of the Acoustical Society of America 62: 1485-1490, phonograph disc.

1978 Watkins, W. A. A radio tag for big whales. Oceanus 21(2): 48-54.

In Press

Watkins, W. A. and W. E. Schevill. Aerial observation of feeding behavior in four baleen whales: *Eubalaena glacialis*, *Balaenoptera borealis*, *Megaptera novaeangliae*, and *Balaenoptera physalus*. Journal of Mammalogy.

Submitted

Watkins, W. A. and W. E. Schevill. Distinctive breeding calls of the harp seal, *Phoca (Pagophilus) groenlandica*. Submitted Fishery Bulletin.

WILLIAM ALFRED WATKINS
Bio-acoustical Engineer
Research Specialist
Woods Hole Oceanographic Institution

[PII Redacted] [REDACTED]

B.A., Wheaton College, Illinois, 1947

Staff, Electrical and radio systems, 1947-1950, Wheaton College
President, West African Broadcasting Association, 1950-1951
Chief, Language Department, 1951-1957, Radio Station ELWA, Liberia
Research Assistant, January 1958-1963; Research Associate, January
1964-1973; Research Specialist, May 1973 to present, Woods
Hole Oceanographic Institution

Research Interests:

Recording and analysis of bio-acoustic phenomena, underwater
sounds of marine mammals, acoustic location techniques, distribu-
tion and behavior of cetacea.

Author or co author of 34 papers in referred scientific publica-
tions, three in technical journals, five W.H.O.I. Referenced
Publications, four reviews, and about eight popular articles
(Oceanus, Natural History, Scientific American, etc.), and
abstracts

WILLIAM E. SCHEVILL
Associate Scientist
Woods Hole Oceanographic Institution

[REDACTED]
A.B., Harvard University, 1927
A.M., Harvard University, 1929

Assistant, then Associate Curator, 1932-1955; Research Associate
in Zoology, 1955 to present, Museum of Comparative Zoology
at Harvard College.
Associate in Physical Oceanography, 1943-1972; Associate Scientist
in Biology 1972-present, Woods Hole Oceanographic Institution

Research Interests:

The biology of marine mammals - particularly the Cetacea,
underwater biological sounds.

Author or co-author of about 70 papers in scientific journals.

Current and Pending Support

William A. Watkins and William E. Schevill are currently supported under Office of Naval Research Contract number N00014-74-C0262 NR 083-004 for 12 man months and 6 man months respectively.

7. ELECTRIC AND MAGNETIC DETECTION IN MARINE ORGANISMS

Adrianus J. Kalmijn

PII Redacted

Publications of the Past Two Years

1976 Kalmijn, A. J. The electric sense of fish and its susceptibility to ELF interference. A paper presented at the N.A.S. workshop on Biosphere Effects of ELF Radiation, Woods Hole, Mass.

1976 Kalmijn, A. J., C. A. Kolba and V. Kalmijn. Orientation of catfish (*Ictalurus nebulosus*) in strictly uniform electric fields: I. Sensitivity of response. *Biol. Bull.* 151: 415.

1976 Kalmijn, V., C. A. Kolba and A. J. Kalmijn. Orientation of fish (*Ictalurus nebulosus*) in strictly uniform electric fields: II. Spatial discrimination. *Biol. Bull.* 151: 415-416.

1977 Kalmijn, A. J. Animal orientation: detection of electric and magnetic cues. *Proc. I.U.P.S.* 12: 60.

1977 Kalmijn, A. J. and R. P. Blakemore. Geomagnetic orientation in marine mud bacteria. *Proc. I.U.P.S.* 13: 364.

1977 Kalmijn, A. J. The electric and magnetic sense of sharks, skates, and rays. *Oceanus*, August.

1978 Kalmijn, A. J. and K. J. Rose. The shark's sixth sense. *Natural History Magazine* 87: 76-81.

1978 Editor of *Science and the Citizen*. Microbial magnets. *Scientific American* 238: 72-73.

1978 Kalmijn, A. J. The electromagnetic sensory world of elasmobranch fishes. In *Sensory Biology of Elasmobranchs*, R. F. Mathewson and E. S. Hodgson [eds.], U.S. Gov't Printing Office. In press.

1978 Kalmijn, A. J. Experimental evidence of geomagnetic orientation in elasmobranch fishes. In *Proceedings in Life Sciences*, Schmidt-König [ed.], pp. 348-354. In press.

1978 Kalmijn, A. J. and R. P. Blakemore. The magnetic behavior of mud bacteria. In: *Proceedings in Life Sciences*, Schmid-König [ed.], pp. 355-356. In press.

197 Kalmijn, A. J. Electromagnetic guidance systems in fishes. Symposium volume, Berkeley conference on Biomagnetic Effects. In prep.

Personnel

ADRIANUS J. KALMIJN
Biophysicist
Associate Scientist
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1959, Candidate in Biology (cum laude), University of Utrecht, The Netherlands
1963, Doctoral Degree in Biology and Physics (cum laude) University of Utrecht, The Netherlands

Research Assistant, 1958-63; Instructor, 1959-62;
Lecturer, 1963-65; Assistant Professor, 1963-70;
Visiting Scientist, summer 1975; University of Utrecht, The Netherlands
Visiting Scientist, fall 1969, Laboratoire Arago, Banyuls-sur-Mer, University of Paris, France
Assistant Neuroscientist, 1970-74, Scripps Institution of Oceanography, University of California, San Diego
Visiting Scientist, summer 1973; Associate Scientist, 1974-present, Woods Hole Oceanographic Institution, Woods Hole, Mass.
Faculty Member, 1974-present, Marine Biological Laboratory, Woods Hole, Mass.

Research in Biophysics: Physical and electrochemical properties of reference and stimulus electrodes; biological instrumentation and measurement techniques; submicroscopical morphology (EM) of lateral-line neuromasts; comparative physiology of invertebrate mechanoreceptors; electrophysiology and functional significance of acustico-lateralis system in fish and amphibia; active and passive electroreception in elasmobranch and higher, bony fishes; origin and biological relevance of electric fields in freshwater and marine habitats; electric and magnetic orientation; physics of electroreceptor systems; biomagnetics of mud bacteria; behavioral approach to sensory biology

A. Kalmijn is currently supported under ONR contract N00014-74-C0262 NR 083-004 for 11 man months, and one man month under the Education Program of the Woods Hole Oceanographic Institution for his teaching duties.

II. CHEMISTRY

DEPARTMENT OF CHEMISTRY

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Biogeochemistry of Seawater Particulates and Surface Sediments

John W. Farrington

(617) 548-1400, ext. 316

(1) Publications Supported by ONR (1977-1978):

Whelan, J. K. (1977). Amino acids in a surface sediment core of the Atlantic abyssal plain. Geochim. Cosmochim. Acta, 41: 803-810.

Farrington, J. W., S. M. Henrichs and R. F. Anderson (1977). Fatty acids and Pb-210 geochronology of a sediment core from Buzzards Bay, Massachusetts. Geochim. Cosmochim. Acta, 41: 289-296.

Lee, C., R. B. Gagosian and J. W. Farrington (1977). Sterol diagenesis in Recent sediments from Buzzards Bay, Massachusetts. Geochim. Cosmochim. Acta, 41: 985-992.

Farrington, J.W., N. M. Frew, P. M. Gschwend and B. W. Tripp (1977). Hydrocarbons in cores of northwestern Atlantic coastal and continental margin sediments. Est. Coast. Mar. Sci.

Farrington, J. W. and B. W. Tripp (1977). Hydrocarbons in surface sediments of the western North Atlantic. Geochim. Cosmochim. Acta, 41: 1627-1641.

Scranton, M. I. and J. W. Farrington (1977). Methane production in the waters off Walvis Bay. J. Geophys. Res., 82: 4947-4953.

Gagosian, R. B. and J. W. Farrington (1978). Sterenes in surface sediments from the southwest African shelf and slope. Geochim. Cosmochim. Acta. In Press.

Lee, C. L., J. W. Farrington and R. B. Gagosian. Sterol geochemistry of sediments from the western North Atlantic Ocean and adjacent coastal areas. Submitted to Geochim. Cosmochim. Acta.

(2) Other Publications

Teal, J. M. and J. W. Farrington (1977). A comparison of hydrocarbons in animals and their benthic habitats. Rapp. P-v. Reun. Cons. Inst. Explor. Mer., 171: 79-83.

Hites, R. A., R. E. LaFlame and J. W. Farrington (1977). Sedimentary polycyclic aromatic hydrocarbons: the historical record. Science, 198: 829-931.

Teal, J. M., K. A. Burns and J. W. Farrington (1978). Analyses of aromatic hydrocarbons in intertidal sediments resulting from two spills of No. 2 fuel oil in Buzzards Bay, Massachusetts. J. Fish. Res. Bd. Can., 35: 510-520.

Farrington, J. W. (1978). Geochemistry of fossil fuel hydrocarbons in marine sediments: selected aspects. Proceedings of Symposium on the State of Marine Environmental Research Laboratory, U.S. Environmental Protection Agency, Narragansett, Rhode Island. In Press.

Gagosian, R. B., S. I. Ahmed, J. W. Farrington, R. F. Lee, R.F.C. Mantoura, K. H. Nealson, T. T. Packard and K. L. Reinhart, Jr. (1978). Future research problems in marine organic chemistry. Marine Chemistry. In Press.

(3) Curriculum Vitae

John W. Farrington
Associate Scientist
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

[PII Redacted]

B. S. (Chemistry), Southeastern Massachusetts University, 1966
M. S. (Chemistry), Southeastern Massachusetts University, 1968
Biochemical Research Laboratories, The Dow Chemical Company, Midland, Michigan - summer, 1968
Ph.D. (Oceanography), Graduate School of Oceanography, University of Rhode Island, FWQA Predoctoral Fellow, 1972
Postdoctoral Investigator, Chemistry Department, Woods Hole Oceanographic Institution, 1971-1972
Assistant Scientist, Chemistry Department, Woods Hole Oceanographic Institution, 1972-1976
Associate Scientist, Chemistry Department, Woods Hole Oceanographic Institution, 1976-Present

Major Research Interests

Organic geochemistry of the marine environment, particularly the sediment-water interface; geochemical aspects of oil pollution problems.

Author or Co-author of 29 publications.

Stuart G. Wakeham
Assistant Scientist
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

Recipient of National Science Foundation Undergraduate Research Fellowship, The College of Wooster, 1968
Summer Employee as a Chemist, Packaging Research Division, Reynolds Metals Co., Richmond, Virginia, 1970
Graduated with Honors in Chemistry, The College of Wooster, 1970
B. A. (Chemistry), The College of Wooster, Wooster, Ohio, 1970
M. S. (Analytical Chemistry), University of Washington, 1972
Ph.D. (Analytical Chemistry), University of Washington, 1976
Teaching (Department of Chemistry) and Research (Department of Oceanography) Assistantships during graduate studies at the University of Washington, 1970-1976
Postdoctoral Research Fellowship, EAWAG, 1976
Assistant Scientist, Woods Hole Oceanographic Institution, August, 1978 --.

Memberships

American Chemical Society; American Association for the Advancement of Science; American Society of Limnology & Oceanography; Phi Lambda Upsilon (National Chemistry Honorary).

Major Research Interests

Analytical chemistry and the application and/or modification of new methodology for solving problems and answering basic questions in geochemistry and the chemistry of aquatic environments; organic geochemistry of aquatic systems.

Publications

Williams, T. R., W. Boettner and S. G. Wakeham (1970). The use of specific ion electrodes for equilibrium measurements. J. Chem. Ed., 47: 464.

Williams, T. R. and S. G. Wakeham (1970). Quantitative brominations of aromatic amines. Anal. Chim. Acta, 52: 12-154.

Carpenter, R. and S. G. Wakeham (1973). Mossbauer studies of marine and freshwater manganese nodules. Chem. Geol., 11: 109-116.

Wakeham, S. G. and R. Carpenter (1974). Electron spin resonance spectra of marine and freshwater manganese nodules. Chem. Geol., 13: 39-47.

Wakeham, S. G. and R. Carpenter (1976). Aliphatic hydrocarbons in sediments of Lake Washington. Limnol. Oceanogr., 21: 711-723.

Wakeham, S. G. (1976). A comparative survey of hydrocarbons in lake sediments. Mar. Pollution Bull., 7: 206-211.

Wakeham, S. G. Synchronous fluorescence spectroscopy and its application to indigenous and petroleum-derived hydrocarbons in lacustrine sediments. Environ. Sci. Tech. In Press.

Wakeham, S. G. A characterization of the sources of petroleum hydrocarbons in Lake Washington. J. Water Pollution Control Fed. In Press.

Wakeham, S. G. Hydrocarbon budgets for Lake Washington. Limnol. Oceanogr. In Press.

(4) Other Sources of Support

Department of Energy Contract EE-77-S-02-4256, "Biogeochemistry of Petroleum Components at the Sediment-Water Interface" to J. M. Teal and J. W. Farrington (Co-principal Investigators), 4/1/78 to 3/31/79 - \$169,280 - (3 months support for Farrington).

University of California Contract for U. S. Environmental Protection Agency Mussel Watch Marine Environmental Monitoring Program, "PCB and Aromatic Hydrocarbons in East and Gulf Coast Mussels" to J. W. Farrington (Principal Investigator), 12/14/77 to 7/1/79 - \$93,438 - (1 month support).

University of Rhode Island Contract for U. S. Environmental Protection Agency funded Marine Ecosystems Research Laboratory, "Biogeochemistry of Fossil Fuel Aromatic Compounds in MERL Experiments" to J. W. Farrington (Principal Investigator) - 7/1/78 to 6/30/79 - \$24,000 - (2 months support).

An Investigation of Multi-Nitrogen Organic Compounds in
Seawater and Sediments

Cindy L. Lee

(617) 548-1400, ext. 453

(1) Publications Supported by ONR (1977-1978):

Lee, C., R. B. Gagosian and J. W. Farrington (1977). Sterol diagenesis in Recent sediments from Buzzards Bay, Massachusetts. Geochim. Cosmochim. Acta, 41: 985-992.

Lee, C., J. W. Farrington and R. B. Gagosian. Sterol geochemistry of sediments from the western North Atlantic Ocean and adjacent coastal areas. Geochim. Cosmochim. Acta. In Press.

(2) Other Publications (1977-1978):

Lee, C. and J. L. Bada (1977). Dissolved amino acids in the Equatorial Pacific, the Sargasso Sea, and Biscayne Bay. Limnol. Oceanogr., 22: 502-510.

Bada, J. L. and C. Lee (1977). Decomposition and alteration of organic compounds dissolved in seawater. Marine Chemistry, 5: 523-534.

(3) Curriculum Vita

Cindy L. Lee

Assistant Scientist
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

[PII Redacted]

B. S. (Chemistry), Arizona State University, 1970
B.S.E. (Chemical Engineering), Arizona State University, 1970
Teaching Assistant, University of California, San Diego, 1971, 1973, 1974
Research Assistant, University of California, San Diego (S.I.O.), 1970-1975
Ph.D. (Oceanography), Scripps Institution of Oceanography, 1975
Postdoctoral Investigator, Woods Hole Oceanographic Institution, 1975-1977
Assistant Scientist, Woods Hole Oceanographic Institution, 1977-Present

Major Research Interests

Marine geochemistry of amino acids; marine geochemistry of sterols; organic nitrogen cycle biogeochemistry.

Publications

Munk, M. E., C. L. Kulkarni, C. L. Lee and P. Brown (1970). Conformational effects in electron impact induced elimination reactions in the 1,2-di-phenylethanol system. Tetrahedron Letters, 16: 1377-1380.

Lee, C. and J. L. Bada (1975). Amino acids in Equatorial Pacific Ocean water. Earth Planet. Sci. Letts., 26: 61-68.

Lee, C., J. L. Bada and E. Peterson (1976). Amino acids in modern and fossil woods. Nature, 259: 183-186.

Lee, C. and J. L. Bada (1977). Dissolved amino acids in the Equatorial Pacific, the Sargasso Sea, and Biscayne Bay. Limnol. Oceanogr., 22: 502-510.

Lee, C., R. B. Gagosian and J. W. Farrington (1977). Sterol diagenesis in Recent sediments from Buzzards Bay, Massachusetts. Geochim. Cosmochim. Acta, 41: 985-992.

Bada, J. L. and C. Lee (1977). Decomposition and alteration of organic compounds dissolved in seawater. Marine Chemistry, 5: 523-534.

Lee, C., J. W. Farrington and R. B. Gagosian. Sterol geochemistry of sediments from the western North Atlantic Ocean and adjacent coastal areas. Geochim. Cosmochim. Acta. In Press.

(4) Other Sources of Support for 1979

National Science Foundation OCE 77-26180, "A Study of the Sedimentary Cycle of Organic Nitrogen Compounds" to Cindy Lee (Principal Investigator) - 1/79 to 6/30/80 - \$40,058 - (7 months of support if renewed).

National Science Foundation DES 75-21278, "Marine Geochemistry of Steroids" to Robert B. Gagosian (Principal Investigator) - 1/79 to 6/30/80 - \$91,100 - (3 months of support for Lee in 1979).

Marine Chemistry of Iron

Oliver C. Zafiriou

(617) 548-1400, ext. 342

(1) Significant Publications (1977-1978)

Zafiriou, O. C. (1977). Marine organic photochemistry previewed. Marine Chemistry, 5: 497-522.

Zafiriou, O. C. and M. B. True (1977). The determination of nitrite in seawater - a revision concerning standardization. Short Communication. Anal. Chim. Acta, 92: 223-225.

Zafiriou, O. C. and M. B. True (1977). Flash photolysis-kinetic spectrophotometry of seawater and related solutions: data acquisition, processing and validation. W.H.O.I. Technical Memorandum # 1-77.

Zafiriou, O. C. and M. B. True (1978). Nitrate photolysis in seawater by sun-light. Submitted to Marine Chemistry.

Zafiriou, O. C. and M. B. True (1978). Nitrite photolysis in seawater by sun-light. Submitted to Marine Chemistry.

Schwarzenbach, R. P., R. H. Bromund, P. M. Gschwend and O. C. Zafiriou (1978). Volatile organic compounds in coastal seawater: stripping method and preliminary results. Submitted to Organic Geochemistry.

Zafiriou, O. C. and M. B. True (1978). Nitrite photolysis as a source of free radicals in productive surface waters. In Preparation.

(2) Curriculum Vita

Oliver C. Zafiriou

Associate Scientist
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

[PII Redacted] [REDACTED] [REDACTED]

B. A. (Magna cum laude), Oberlin College, 1962
Ph.D., Johns Hopkins, 1966
Research Associate, Florida State University, 1966-1967
Research Associate, Johns Hopkins University, 1967-1968
Assistant Professor, Haverford College, Pennsylvania, 1968-1969
Assistant Scientist, Woods Hole Oceanographic Institution, 1969-1974
Associate Scientist, Woods Hole Oceanographic Institution, 1974-Present

Major Research Interests

Solar photolysis of nitrate and nitrite in seawater; photochemical generation of singlet oxygen in seawater; volatile organic compounds in coastal waters and marshes; volatile organic compounds in non-coastal waters; volatile organics and air-sea gas exchange; chemical fate of photolysis products in seawater, NO and OH.

Other Activities

GC-MS Facility Committee - member
Educational Council - member
Thesis Advisory Committee, Co-chairman (P. M. Gschwend)
Pre-general Advisory Committee, Chairman (R. A. Anderson)
Special Reading Course - Marine Photochemistry
AAAS, ACS, American Society for Photobiology - member

Publications

White, E. H., O. C. Zafiriou, H. M. Kagi and J.H.M. Hill (1964). The chemiluminescence of luminol: the chemical reaction. J. Am. Chem. Soc., 86: 940.

Saltiel, J., O. C. Zafiriou, E. D. Megarity and A. A. Lamola (1968). Tests of the singlet mechanism for cis-trans photoisomerization of the stilbenes. J. Am. Chem. Soc., 90: 4759.

White, E. H., E. G. Nash, D. R. Roberts and O. C. Zafiriou (1968). A chemiluminescent diazaquinone. J. Am. Chem. Soc., 90: 5932.

White, E. H., D. F. Roswell and O. C. Zafiriou (1969). The anomalous chemiluminescence of phthalic hydrazide. J. Org. Chem., 34: 2562.

Saltiel, J. and O. C. Zafiriou (1969). The photochemistry of myrcene in methanol. The question of methanol enhancement of S₁-T intersystem crossing dienes. Molecular Photochemistry, 1: 319.

Zafiriou, O. C., K. H. Whittle and M. Blumer (1972). Response of Asterias vulgaris in bivalves and bivalve tissue extracts. Marine Biology, 13: 137-145.

Zafiriou, O. C. (1972). Response of Asterias vulgaris to chemical stimuli. Marine Biology, 17: 100-107.

Wang, S. Y., B. S. Hahn, C. Fenselau and O. C. Zafiriou (1972). Enrichment of ¹⁸O in the nucleic acid bases. Biochem. Biophys. Res. Comm., 48: 1630-1635.

Zafiriou, O. C. (1973). Petroleum hydrocarbons in Narragansett Bay. Part II. Chemical and isotopic analyses. J. Coast. Mar. Sci., 1.

Zafiriou, O. C. (5/1973). Improved method of characterizing environmental hydrocarbons by gas chromatography. Analytical Chemistry.

Zafiriou, O. C. (1973). Interference of oil spill emulsifiers with gas chromatography. Marine Pollution Bulletin, 4: 87.

Zafiriou, O. C., J. Myers, R. Bourbonniere and F. J. Freestone (1973). Oil spill-source correlation by gas chromatography: an experimental evaluation of system performance. Proceedings of 1973 Conference on Prevention and Control of Oil Spills.

Zafiriou, O. C. (1974). Photochemistry of halogens in the marine atmosphere. J. Geophys. Res., 79: 2730-2732.

Publications (Cont.)

Zafiriou, O. C. (1974). Sources and reactions of OH and daughter radicals in seawater. J. Geophys. Res., 79: 4491-4496.

Zafiriou, O. C. (1975). Reaction of methyl halides with seawater and marine aerosols. J. Mar. Res., 33: 75-81.

Zafiriou, O. C. and M. B. True (1977). The determination of nitrite in seawater - a revision concerning standardization. Short Communication. Anal. Chim. Acta, 92: 223-225.

Zafiriou, O. C. and M. B. True (1977). Flash photolysis - kinetic spectrophotometry of seawater and related solutions: data acquisition, processing and validation. W.H.O.I. Technical Memorandum # 1-77.

Zafiriou, O. C. (1977). Marine organic photochemistry previewed. Marine Chemistry, 5: 497-522.

Zafiriou, O. C. and M. B. True (1978). Nitrate photolysis in seawater by sun-light. Submitted to Marine Chemistry.

Zafiriou, O. C. and M. B. True (1978). Nitrite photolysis in seawater by sun-light. Submitted to Marine Chemistry.

Schwarzenbach, R. P., R. H. Bromund, P. M. Gschwend and O. C. Zafiriou (1978). Volatile organic compounds in coastal seawater: stripping method and preliminary results. Submitted to Organic Geochemistry.

(3) Other Sources of Support

National Science Foundation OCE 77-08696 A01, "Chemical Effects of Light in the Sea" to O. C. Zafiriou (Principal Investigator), 5/1/78 to 4/30/79 - \$71,995 - (7 months support).

National Science Foundation-IDOE OCE 77-12914 - SEAREX Program, "Sources and Fluxes of Organic Compounds in the Marine Atmosphere" to R. B. Gagosian and O. C. Zafiriou (Co-principal Investigators), 10/1/77 to 9/30/79 - \$192,536 - (3 months support for Zafiriou from 10/1/78 to 9/30/79).

NOAA-Sea Grant Program 22/4000.16, "Natural and Anthropogenic Volatile Compounds in Coastal Waters: Levels, Sources, and Sinks" to O. C. Zafiriou (Principal Investigator), 7/1/78 to 6/30/79 - \$15,000 - (1 month support).

National Science Foundation ATM 78-00997, "Atmospheric and Air-Sea Interactive Chemistry in the Central Equatorial Pacific" to O. C. Zafiriou (Principal Investigator), 2/1/78 to 7/31/79 (no salary support).

III. GEOLOGY AND GEOPHYSICS

VOLUME II
GEOLOGY AND GEOPHYSICS

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	ROSE Project (G&G-24)
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Groman	Data Processing and Management G&G-105
Johnson	Sea Floor Samples Laboratory G&G-111
Ross	Marginal Seas G&G-117

Curriculum Vitae

ELIZABETH T. BUNCE
Geophysicist
Senior Scientist
Woods Hole Oceanographic Institution

PII Redacted

A.B., Smith College, 1937
M.A. (Physics), Smith College, 1949
Sc.D. (Honorary), Smith College, 1971

Instructor (Physics), Smith College, 1949-51

Research Associate, July 1952-64; Associate Scientist, September 1964-75; Senior Scientist, April 1975 to present, Acting Chairman, Geology & Geophysics Department, February - July 1977, Woods Hole Oceanographic Institution

Fellow, Geological Society of America
Member, Sigma Xi
Member, American Geophysical Union
Member, Society of Exploration Geophysicists
Member, American Association of Petroleum Geologists
Member, Committee of 9, 1970; Staff Committee, 1971-73;
1974-1976; Admissions Committee of the Joint Education Program, 1972, 1973; Equal Opportunity Task Force, 1973-74, Woods Hole Oceanographic Institution; Joint Committee on Ocean Engineering, 1976- ; Ships' Committee, 1976-78; Marine Advisory Committee, 1978- .

Member, JOIDES Indian Ocean Panel, 1971 to 1973 termination
Member, JOIDES IPOD Site Survey Advisory Panel, 1974-1978
Member, AAPG Environmental Geology Committee, 1974-77
Member, Marine Biological Laboratory Library Committee, 1976 to present

Research Interests: Crustal structure; marine seismology; reflection and refraction; underwater acoustics associated with sea floor studies

Author or co-author of papers in marine geophysics

September 1978

RELEVANT BIBLIOGRAPHY

Ben-Avraham, Z., and E.T. Bunce, 1977. Geophysical Study of the Chagos-Laccadive Ridge, Indian Ocean. *Jour. Geophys. Res.*, 82 (8): 1295-1305.

Bunce, E.T. and P. Molnar, 1977. Seismic Reflection Profiling and Basement Topography in the Somali Basin: Possible Fracture Zones between Madagascar and Africa. *Jour. Geophys. Res.*, 82, (33): 5305-5311.

McDowell, S., N. Kumar, R. Jacobi, D.A. Johnson and E.T. Bunce, 1977. Regional Setting of Site 357, north flank of Rio Grande Rise, In Initial Reports of Deep Sea Drilling Project, 39: Washington D.C., U.S. Gov't. Printing Office.

Chase, R.L., E.T. Bunce and J.D. Phillips, 1975. Geophysical Study of Antilles Outer Ridge, Puerto Rico Trench, and Northeast Margin of Caribbean Sea: Reply, *Am. Assoc. Petrol. Geol. Bull.*, 59 (12): 2323-2324.

Hobart, M.A., E.T. Bunce and J.G. Sclater, 1975. Bottom water Flow through the Kane Gap, Sierra Leone Rise, Atlantic Ocean. *Jour. Geophys. Res.*, 80 (36): 5083-5088.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Seismology	ONR N00014-C0262	6.0	\$260,000	1/1/78-12/31/78
Mid-Plate, Mid-Gyre Seabed Disposal Assessment Program	Sandia Laboratories (pending)	1.0	\$ 99,707	10/1/78-9/30/79
WHOI Education Program		1.0		1/1/78-12/31/78
Woods Hole Oceanographic Institution		1.0		1/1/78-12/31/78

Curriculum Vitae

Name: Robert S. Detrick, Jr.
Marine Seismologist
Post Doctoral Investigator

[PII Redacted]

B.S., 1971 Lehigh University
M.S., 1974 Scripps Institution of Oceanography and
University of California, San Diego
Ph.D., 1978 Massachusetts Institute of Technology and
Woods Hole Oceanographic Institution

Professional History:

1971-1974 Scripps Institution of Oceanography, Marine Physical
Laboratory, Research assistant (half-time)
1974-1975 Standard Oil Company of California, San Francisco
exploration geophysicist
1975-1978 MIT/WHOI Research assistant (half-time)
1978-Present Woods Hole Oceanographic Institution, Post-
doctoral research investigator with Dr. G.M. Purdy

Related Publications:

Purdy, G.M. and R.S. Detrick, 1978. A seismic refraction experiment
in the central Banda Sea, *J. Geophys. Res.*, 83, 2247.

Detrick, R.S., J.D. Mudie, B.P. Luyendyk and K.C. Macdonald,
1973. Near-bottom observations of an active transform fault
(MAR 37°N), *Nature Phys. Sci.*, 246, 59.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Seismology	ONR N00014-C-0262 NRO83-004	12.0	\$260,000	1/1/78-12/31/78

Curriculum Vitae

John I. Ewing
Geophysicist
Senior Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

B.S., Physics, Harvard University, 1950

Research Assistant, Research Associate, Senior Research Associate,
1950-1976, Lamont-Doherty Geological Observatory
Associate Director for Research, 1973-1976, Lamont-Doherty
Geological Observatory
Adjunct Professor of Geology, 1975-present, Columbia University

Chairman of Geology and Geophysics Department, January 1976 to
present; Senior Scientist, January 1976 to present, Woods
Hole Oceanographic Institution

Presented series of lectures at Institute of Oceanology, Moscow
at invitation of U.S.S.R. Academy of Sciences, December
1969

Recorded lecture for Voice of America broadcast, requested by
U.S. National Academy of Sciences, National Research
Council, Committee on Oceanography, 1969

AGU Visiting Scientist Lecturer in Geophysics, 1971

Fellow, American Geophysical Union
Member, Society of Exploration Geophysicists
Member, American Association for the Advancement of Science
Member, Underwater Sound Advisory Group, 1967-1969
Member, JOIDES Pacific Advisory Panel, 1968-1970
Member, JOIDES Atlantic Advisory Panel, 1970-1975
Member, IDOE Proposal Review Panel, 1971-1973
Member, JOIDES Planning Committee, 1972-1977
Chairman, JOIDES Planning Committee, 1975-1977
Member, NRC Committee for Oceanography, 1975
Member, NRC Committee for Seismology, 1975-1976
Member, IDOE Advisory Committee, 1975-1976
Member, U.S./U.S.S.R. Working Group in Seismology, 1975-present
Member, NRC Continental Margins Panel, 1976-1977
Member, International Association for the Physical Sciences
of the Ocean (IUGG) 1977-present

Medal by Gulf Coast Association of Geological Societies for
paper on diapirs in the southwestern Gulf of Mexico, 1967
Recipient SEPM Francis P. Shepard Medal, 1976

Research Interests: Marine seismology; marine geology
Author or co-author of about 100 papers in marine geology and
geophysics

Relevant Bibliography:

Houtz, R., and J. Ewing, 1976. Upper crustal structure as a function of plate age, Jour. Geophys. Res., 81(14), p.2490-2498.

Tucholke, B.E., G.M. Bryan and J.I. Ewing, 1977. Gas-hydrate horizons detected in seismic-profiler data from the western North Atlantic, AAPG Bull., 61(5), p.698-707,

Sheridan, R.E., C.C. Windisch, J.I. Ewing and P.L. Stoffa. Seismic reflection profiles across Blake escarpment, submitted for publication in AAPG Memoir on Continental Slopes.

Ludwig, W.J., J.I. Ewing, C.C. Windisch, A.G. Lonardi and F.F. Rios, submitted for publication in AAPG Memoir on Continental Slopes. Structure of Colorado Basin and continent-ocean crust boundary off Bahia Blanca, Argentina.

Ewing, J. and R. Houtz, submitted for publication in the Second Maurice Ewing Memorial Symposium, Vol. 2. Acoustic stratigraphy and structure of the oceanic crust.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Seismology Studies	ONR N00014-74-C0262 NR083-004	4.0	\$260,000	1/1/78-12/31/78
Rose Inter-comparison Tests	"	N/C	\$ 23,230	1/1/78-12/31/78
Bermuda Earth-quake Study	U.S.G.S.	.5	\$ 61,916	5/15/78-5/14/79
Post Drilling Site Survey - Site 2.3	IPOD Program - Lamont-Doherty	1.0	\$ 75,000	1/1/78-12/31/78
Woods Hole Oceanographic Institution		6.0		

Curriculum Vitae

Graham Michael Purdy
Marine Geophysicist
Assistant Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

B.Sc. (Hon.) Imperial College, London University, 1969
A.R.C.S. Major subject: Physics

M.Sc. Imperial College, London University, 1970
D.I.C. Major subject: Geophysics

Ph.D. Cambridge University, 1974

Postdoctoral Scholar, 1974 to October, 1975
Woods Hole Oceanographic Institution

Assistant Scientist, October, 1975 to present
Woods Hole Oceanographic Institution

RELEVANT BIBLIOGRAPHY

Rabinowitz, P.D. and G.M. Purdy, 1976. The Kane Fracture Zone in
the western Central Atlantic Ocean. *Earth. Planet. Sci. Lett.*
33, 21.

Purdy, G.M. and R.S. Detrick, 1978. A seismic refraction experiment
in the Central Banda Sea. *Jour. Geophys. Res.* 83, 2247.

Purdy, G.M., P.D. Rabinowitz and Hans Schouten. The Mid-Atlantic
Ridge at 23°N: Bathymetry and magnetics. *Init. Reports DSDP*
Lol. 45. (in press).

Barrett, D.L. and G.M. Purdy. IPOD Site 6: Seismic refraction
results. *Init. Reports DSDP Vol. 45*. (in press).

Jacobson, R., G.G. Shor, R.M. Kieckhefer and G.M. Purdy. Seismic
refraction and reflection studies in the Timor-Aru Trough
system and Australian Continental Shelf. *A.A.P.G.* (in press).

G.M. Purdy, R.D. Rabinowitz and J.J. Veltrop, 1978. The Kane Fracture
Zone in the eastern Central Atlantic Ocean. *Earth Plan. Sci.*
Lett. (submitted).

Purdy, G.M. and Kristin Rohr, 1978. A Geophysical Survey within
the Mesozoic magnetic anomaly sequence south of Bermuda. *Jour.*
Geophys. Res., in press.

Koelsch, Donald E. and G.M. Purdy, 1978. An ocean bottom hydrophone instrument for seismic refraction experiments in the deep ocean. *Marine Geophys. Res.*, in press.

Purdy, G.M. and David Twichell, 1978. Sediment Distribution around the Bouvet Triple Junction. *Marine Geology*, 28, 53-57.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Seismology	ONR N00014-C0262 NR083-004	8.0	\$260,000	1/1/78-12/31/78
Bermuda Earthquake Study	U.S.G.S.	1.0	\$ 62,000	5/1/78-4/30/79
Post-Drilling Survey at Site 2.3	I.P.O.D. (Lamont-Doherty)	.25	\$ 75,000	1/1/78-12/31/78
A Downhole Oblique Seismic Experiment in the Pacific	NSF (pending)	N/C	\$ 35,322	11/1/78-10/31/79

Curriculum Vitae

Name: Ralph Archibald Stephen
Geophysicist
Assistant Scientist

[PII Redacted] [REDACTED]

B.A.Sc. 1974 University of Toronto
Ph.D., 1978 University of Cambridge

Stephen R.A., 1976. Synthetic seismograms for the case of the receiver within the medium, Polish Academy of Science, in press.

Stephen, R.A., 1977. Synthetic seismograms for the case of the receiver within the reflectivity zone, Geophys. J.R. astr. Soc., 51, 169-181.

Stephen, R.A., K.E. Louden and D.H. Matthews. The oblique seismic experiment on DSDP Leg 52, Initial Reports of the Deep Sea Drilling Project, in press.

Stephen, R.A., 1978. The oblique seismic experiment in oceanic crust, Ph.D. Thesis, University of Cambridge, Cambridge, U.K.

Salisbury, M.H. and R.A. Stephen, 1978. The physical state of the upper levels of Cretaceous basement from the results of logging, laboratory studies and the oblique seismic experiment at DSDP Site 417D, Maurice Ewing Series, in press.

Salisbury, M.H., R.A. Stephen, Y. Hamano, D. Johnson, M. Donnelly, J. Francheteau and N. Christensen, 1978. The physical state of the upper levels of Cretaceous basement from the results of logging, laboratory studies and the oblique seismic experiment at DSDP Site 417D, Initial Report of DSDP, in press.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollars</u>	<u>Duration</u>
Seismology	ONR N00014-74-60262 NR083-004	4.0	\$260,000	1/1/78-12/31/78
A Downhole Oblique Seis- mic Experiment in the Pacific	NSF (pending)	5.0	\$ 35,322	11/1/78-10/31/79

Curriculum Vitae

CHARLES R. DENHAM
Geophysicist
Associate Scientist

[PII Redacted]

[REDACTED]

B.S., South Dakota School of Mines and Technology, 1967
M.S., Stanford University, 1970
Ph.D., Stanford University, 1972

Seismograph Attendant, South Dakota School of Mines and
Technology, 1967
Computer Operator and Consultant, South Dakota School of
Mines and Technology, 1965-1967
Electric Well-logger, South Dakota State Geological Survey,
Summer 1965
Geologist-Geophysicist, Shell Oil Company, summers 1966-1968
Teaching and Research Assistant, Stanford University, 1968-1972
Postdoctoral Fellow, Woods Hole Oceanographic Institution, 1972-1973
Assistant Scientist, Woods Hole Oceanographic Institution, 1973-1977
Associate Scientist, Woods Hole Oceanographic Institution, 1977-present

PUBLICATIONS AND TECHNICAL REPORTS 1977-1978

Denham, C.R., R.F. Anderson, and M.P. Bacon, 1977. Paleomagnetism and
radiochemical age estimates for Late Brunhes polarity episodes.
Earth Planet. Sci. Letters, 35: 384-397.

Denham, C.R., 1977. PATSY: a time-series processor. Woods Hole Oceanographic
Institution Technical Report WHOI-77-17, 48 p.

Denham, C.R., 1977. The VECTOR processor. Woods Hole Oceanographic
Institution Technical Report WHOI-77-19, 38 p.

Denham, C.R., 1978. Oblique anhysteretic remanent magnetization.
Submitted to Jour. Geophys. Res. 50 ms. pages.

Denham, C.R., 1978. Interpolation of time-series on the unit-sphere.
Submitted to Geophys. Jour. Roy. astr. Soc., 50 ms. pages.

Denham, C.R., 1978. Statistical sedimentation and magnetic polarity
stratigraphy. Submitted to Symposium on the New Uniformitarianism,
W.B. Berggren and J. Van Couvering (editors) Princeton Press,
39 ms. pages.

CURRENT AND PENDING SUPPORT

C. R. Denham

<u>Title</u>	<u>Agency</u>	<u>Man/ Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Marine Magnetic Anomalies	ONR N00014-74- C-0262; NR083-004	2.0	\$35,000	1/1/78 - 12/31/78
Data Processing & Management	ONR N00014-74- C-0262; NR083-004	N/C	\$25,000	1/1/78 - 12/31/78
Magnetostratigraphy of Oligocene-Miocene	NSF EAR76-13359	6.0	\$29,500	8/15/76 - 7/31/78
Mammal-Bearing Sediments on the Northern Great Plains		12.0	\$88,814 (pending)	11/1/78 - 10/31/80
The Northward Motion of Indian Ocean based on Paleolatitudes from DSDP Sites near the Ninetyeast Ridge	NSF OCE76-20028	4.0	\$17,140	12/1/76 - 5/31/78
Marine Sedimentary Paleomagnetism and Heat Flux through the N. Atlantic Ocean Floor	NSF OCE76-82255	8.0	\$100,000	2/1/77 - 1/31/79

Curriculum Vitae

Hans Schouten
Geophysicist
Associate Scientist
Woods Hole Oceanographic Institution

PII Redacted

[REDACTED]

B.S., University of Utrecht, The Netherlands, 1961

Geology and Geophysics

Ph.D., University of Utrecht, The Netherlands, 1970

Research Associate, 1965-January 1967; Assistant Scientist, January 1967-January 1971; Associate Scientist, January 1971-January 1975, University of Utrecht (Vening Meinesz Laboratory) Department of Marine Geophysics

Associate Scientist, May 1975 to present, Woods Hole Oceanographic Institution

Member, European Association of Exploration Geophysicists

Member, American Geophysical Union

Honors, Vening Meinesz Award 1972

Research: Participated in VML cruises since 1964 aboard H. Neth. M. Navy ships and K.N.S.M. freight ships; participated in the NAVADO project onboard H. Neth. M.S. SNELLIUS, seismic refraction studies in the North Sea basin and the Netherlands-Surinam geotraverse aboard a variety of K.N.S.M. freight ships. Spent 9 months at the Lamont-Doherty Geological Observatory in 1971 on a grant from the Netherlands Organization for the Advancement of Pure Research (ZWO) High resolution analysis of marine magnetic anomalies and their bearing on plate motions, reorganization of plate motions, evolution of accreting boundaries and fracture zones, the nature of the sea floor spreading magnetic anomaly source layer and its emplacement. The statistical relationship between magnetics, gravity and bathymetry in the oceans. Detailed reconstruction of the central North Atlantic history of sea floor spreading.

PUBLICATIONS

Schouten, Hans and Kim D. Klitgord, 1977, Mesozoic magnetic anomalies in the western North Atlantic, U.S.G.S. Misc. Field Studies Map MF-915, Scale 1:2,000,000.

Purdy, G.M., Philip D. Rabinowitz and Hans Schouten, The Mid-Atlantic Ridge at 23°N: Bathymetry and Magnetics. Initial Reports of DSDP vol. 45, in press.

Purdy, G.M., Hans Schouten, J. Crowe, D. Barrett, R. Falconer, G. Uditsev, N. Marova, V. Litvin and G. Valyashko et al. IPOD Site 6: A Site Survey - Initial Reports of DSDP, vol. 45, in press.

Bowin, Carl, R.S. Lu, Chao-Shing Lee and Hans Schouten, Plate convergence and accretion in the Taiwan-Luzon region, Amer. Assoc. Petrol. Geol. Bull., in press.

Schouten, Hans and Kim D. Klitgord (in preparation) Mesozoic magnetic anomalies in the western North Atlantic - a pattern of early plate motions.

Klitgord, Kim D., Hans Schouten and John C. Behrendt (in preparation) Jurassic fracture zones in the western Atlantic magnetic quiet zone.

Schouten, H. and C.R. Denham, 1978 in press. Numerical models of the sea floor spreading magnetic anomaly source layer. In: Implications of Deep Drilling Results in the Atlantic Ocean, The Second Maurice Ewing Memorial Symposium, ed. M. Talwani.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Amount</u>	<u>Duration</u>
Marine Magnetic Anomalies	ONR N00014-C0262 NR083-004	4.0	\$35,000	1/1/78-12/31/78
Analysis of Marine Magnetic Data in the OCE76-22512 Centr. Atlantic	NSF OCE76-22512	12.0	\$75,000	12/1/76-5/31/79
WHOI Education Program		1.0		1/1/78-12/31/78

Curriculum Vitae

CARL OTTO BOWIN
Geologist
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.S., California Institute of Technology, 1955
M.S., Northwestern University, 1957
Ph.D., Princeton University, 1960

Instructor, Princeton University, 1960-61

Research Associate, July 1961-1963; Assistant Scientist,
September 1963-1965; Associate Scientist, September
1965 to present, Woods Hole Oceanographic Institution

Member, Journal Club Committee, 1963-66; Computer Committee,
1963-72; Computers-at-Sea Committee, 1965-68; Summer
Program Committee, 1966-68 (Chairman, 1969); Bigelow
Medalist Committee, 1970 (Prepared and read citation for
presentation of the Bigelow Medal to Frederick J. Vine,
June 17, 1970); elected by Staff to be member of the
Staff Committee, 1970 (Chairman, 1971); Recreation Committee,
1975-76, Woods Hole Oceanographic Institution

Participant, Visiting Geological Scientist Program, American
Geological Institute, 1965, 1969

Member, ad hoc Drafting Group on Guide for Solid-Earth Data
Exchange, National Academy of Sciences, November, 1971

Participant, Mid-Atlantic Ridge Workshop, National Academy of
Sciences, January, 1972

Participant, Teaching Graduate Course in Marine Geophysics
M.I.T. 1965, Woods Hole Oceanographic Institution, 1970
to present

Chairman, Falmouth Out of School (FOOS) community participation
program for sixth grade students, 1970 to present

Member, Steering Group, IDOE Southeast Asia Metallogenesis and
Petroleum Resource Program, 1974 to present

Consultant, National Science Foundation, 1977-1978

Member, Board of Directors, Falmouth Artists Guild, 1978

Research Interests: Tectonics of the Earth and planetary
bodies; particular recent emphasis has been on collisions of
island arcs with continents, and studying the transfer function
between topography and gravity anomalies. Development and use
of portable automatic data processing and control systems
for ships, submarines, and airplanes with emphasis on gravity
investigations.

Author or co-author of 50 papers published or in press

June 1978

PUBLICATIONS

C.O. Bowin

McKenzie, Dan and Carl Bowin, The relationship between bathymetry and gravity in the Atlantic Ocean, Jour. of Geophysical Res., v. 81, no. 11, p. 1903-1915, 1976.

Sclater, J.G., C. Bowin, R. Hey, H. Hoskins, J. Pierce, J. Phillips, and C. Tapscott. The Bouvet Triple Junction, Jour. of Geophysical Res., v. 81, no. 11, p. 1857-1869, 1976.

Uchupi, Elazar, K.O. Emery, C.O. Bowin, and J.D. Phillips. Continental margin off western Africa: Senegal to Portugal, Amer. Association of Petrol. Geologists Bull., v. 60, no. 5, p. 809-878, 1976.

Bowin, Carl. Caribbean gravity field and plate tectonics, Geol. Soc. of America, Special Paper 169, 79 pp, 1976.

Bowin, Carl. Data Assimilation, In Proceedings of Working Conference on Oceanographic Data Systems, Nov. 12-14, 1975, C.D. Tollios and K.E. Peal (eds) p. 233-247.

Segawa, Jiro and Carl Bowin, Gravity in the Junction between the Japanese and the Izu-Bonin Islands, Jour. Phys. Earth, 24, p. 275-311, 1976.

Segawa, Jiro and Carl Bowin, Measurement of Gravity, Preliminary Report of the Hakuhō Maru Cruise KH-72-2 (The Southwest Japan Arc and Ryuku Arc Areas) Ocean Research Institute, University of Tokyo, 1975.

Bowin, Carl, Richard S. Lu, Chao-Shing Lee and Hans Schouten, Plate Convergence and Accretion in the Taiwan-Luzon Region, Amer. Assoc. of Petroleum Geologists Bulletin, September 1978.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Gravity Field & Dev. of Gravimeter	ONR N00014-C0262 NR083-004	6.0	\$180,000	1/1/78-12/31/78
Banda-Sea; Marine Geo- physical Studies	NSF OCE77-24229 (Supplement Pending)	2.5	\$ 30,000 \$ 17,000	11/1/77-10/30/78
Airborne Gravity and Topographic Measurements of Plate Convergent Zones	NASA (pending)	2.0	\$ 45,336	1/1/79-12/31/79

Curriculum Vitae

John D. Milliman
Marine Geologist
Associate Scientist
Woods Hole Oceanographic Institution
Woods Hole, MA 02543

[PII Redacted]

[REDACTED]

B.S. University of Rochester, 1960
M.S. University of Washington, Seattle, 1963
Ph.D. University of Miami, 1966 (Oceanography)
Graduate Assistant (Research and Teaching) - 1960-63, University of Washington, Department of Oceanography
Research Assistant, 1961, University of Washington, Department of Radiation Biology
Graduate Fellow, 1963-66, University of Miami, Institute of Marine Sciences
Assistant Scientist, 1966-71, Woods Hole Oceanographic Institution
Alexander von Humboldt Stiftung Guest Professor, 1969-70, Laboratorium für Sedimentforschung, Universität Heidelberg
Associate Scientist, 1971 to present, Woods Hole Oceanographic Institution
Non-resident Staff Member - West Indies Laboratory, Farleigh-Dickinson University, St. Croix, Virgin Islands, 1972-present.
Canadian Geological Survey, Vancouver, 1975-76
Member, Geological Society of America
Member, Society of Economic Paleontologists and Mineralogists
Member, American Association for the Advancement of Science
Member, International Association of Sedimentologists
Co-editor of Contributions to Sedimentology (Schweizerbart'sche)
Editorial Board Sedimentology
Research: Marine Geology; especially the transport, deposition, and diagenesis of sediments
Author or co-author of approximately 75 scientific publications, 35 abstracts, and 20 book reviews

Relevant Bibliography

Milliman, J.D. (1977) Effects of arid climate and upwelling upon the sedimentary regime off southern Spanish Sahara. Deep-Sea Res., 24, 95-103.

Milliman, J.D. (1977) Dissolution of calcium carbonate in the Sargasso Sea (northwest Atlantic), In Fate of Fossil CO₂ in the Oceans, Plenum Press, p. 641-653.

Milliman, J.D. and Müller, J. (1977) Characteristics and genesis of shallow-water and deep-sea limestones In Fate of Fossil CO₂ in the Oceans, Plenum Press, p. 655-672.

Vicalvi, M.A. and Milliman, J.D. (1977) Carbonate sedimentation on the continental shelf off southern Brazil, with special reference to the benthic foraminifera. Amer. Assoc. Petrol. Geol. Studies in Geology, v. 4, p. 313-328.

Emery, K.O. and Milliman, J.D. (1978) Suspended matter in surface waters: Influence of river discharge and of upwelling. Sedimentology, 25, 125-140.

Milliman, J.D. (1978) Morphology and structure of upper continental margin off southern Brazil. Amer. Assoc. Petrol. Geol. Bull., v. 62, No. 6, p. 1029-1048.

Fainstein, R. and Milliman, J.D. (in press) Structure and origin of three continental margin plateaus, northeastern Brazil. Amer. Assoc. Petrol. Geol. Bull.

Milliman, J.D. (in press) Morphology and structure of the Amazon upper continental margin. Amer. Assoc. Petrol. Geol. Bull.

Fitzgerald, M.G., Parmenter, C.M. and Milliman, J.D. (in press) Particulate calcium carbonate in New England shelf waters: result of shell degradation and resuspension. Limnol. Oceanogr.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Calcium Carbonate in the Deep Sea	ONR N00014-C0262 NR083-004	5.25	\$ 90,000	1/1/78-12/31/78
Study of Suspended Sediment on the East Coast Continental Shelf	U.S.G.S. Contract No. 14-08-0001-15655	4.5	\$ 45,000	1/1/78-9/30/78
Source and Fate of Estuarine Sediments, Boston Harbor	NOAA-Sea Grant	1.5	\$ 40,100	7/1/77-12/31/78
WHOI Education Program		N/C	\$ 51,000	7/1/78-6/30/79
		1.5		1/1/78-12/31/78

CURRICULUM VITAE

Kathleen Crane
Marine Geologist
Postdoctoral Investigator
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.A., 1969-1973 Oregon State University
1971-1972 Universitat Stuttgart Germany
1973 Field Research, West Indies Laboratory,
St. Croix, U.S. Virgin Islands

Ph.D. 1973-1977 Teaching and Research Assistant, University
of California, San Diego, Scripps Institution
of Oceanography. Title of dissertation:
"Hydrothermal Activity and Near-Axis Structure
at Mid-Ocean Spreading Centers".

1977 Postdoctoral Investigator, Scripps Institution
of Oceanography

1977 Astronaut Candidate Finalist, NASA Space
Shuttle Program

1978 Postdoctoral Investigator, Woods Hole
Oceanographic Institution

RELEVANT BIBLIOGRAPHY

Crane, K., 1976. The intersection of the Siqueiros Transform Fault
and the East Pacific Rise. *Marine Geology*, v. 21, p. 25-46.

Crane, K. and W.R. Normark, 1977. Hydrothermal activity and structure
of the East Pacific Rise 21°N. *Jour. Geophys. Res.*, v. 82,
p. 5336-5348.

Crane, K., 1978. Structure and tectonics of the Galapagos Inner Rift.
Jour. Geology, in press.

Crane, K., 1978. Hydrothermal stress drops and convective patterns at
three mid-ocean spreading centers. *Tectonophysics*, in press.

Corliss, J., M. Lyle, J. Dymond and K. Crane, 1978. Hydrothermal
deposits near the Galapagos Rift. *Earth and Planetary Science
Letters*, submitted.

Crane, K. and R.D. Ballard, 1978. The Galapagos Rift 85°W.4: Structure and morphology of hydrothermal fields. *Jour. of Geophys. Res.*, submitted.

Crane, K., 1978. The Galapagos Rift 86°W.5: Morphological waveforms. *Jour. of Geophys. Res.*, submitted.

Corliss, J.B., J. Dymond, L. Gordon, J. Edmond, R.P. Von Herzen, R.D. Ballard, K. Green, D. Williams, A. Bainbridge, K. Crane, and Tj.H. Van Andel, 1978. Exploration of submarine thermal springs on the Galapagos Rift. *Science*, submitted.

Williams, D.L., J.B. Corliss, J. Dymond, M. Lyle, R.P. Von Herzen, R.D. Ballard, K. Green, K. Crane, and Tj.H. Van Andel, 1978. A visit to the hydrothermal mounds of the Galapagos Spreading Center, in prep.

Macdonald, K.C., K. Kastens, K. Crane, F.N. Spiess, and S. Miller, 1978. The Tamayo Transform Fault, in prep.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollars</u>	<u>Duration</u>
Volcanic and Tectonic Pro- cesses of Accreting Plate Boundaries	ONR N00014-C0262 NR083-004	4.0	\$ 39,270	1/1/78-12/31/78
Remote Sensing for Periodic Geothermal Oscillations at the East African Rift	NASA	5.0	\$ 74,925	10/1/78-9/30/79
Argus Survey at the Oceano- grapher Fracture Zone	NSF (pending)	7.0	\$220,000	1/1/79-12/31/79

CHARLES DAVIS HOLLISTER
Marine Geologist
Associate Scientist
Woods Hole Oceanographic Institution

PII Redacted

[REDACTED]

B. S., Oregon State University, 1960
Ph.D., Columbia University, 1967
Assistant Scientist, 1967-72; Associate Scientist, 1972 to present
Woods Hole Oceanographic Institution

Fellow, Geological Society of America
Fellow, American Association for the Advancement of Science
Member, American Geophysical Union
Member, American Association of Petroleum Geologists
Member, International Association of Sedimentologists
Member, Society of the Sigma Xi
Member, Society of Economic Paleontologists and Mineralogists
Member, JOIDES Atlantic Advisory Panel
Member, American Association of University Professors
Member, Honorary Deep-Sea Biological Society
Member, New York Academy of Science

Chairman of workshop entitled "Resource Potential and Environmental Stability of Planet Earth for the Next Million Years", November 1976 (NRC) U.S. Nuclear Regulatory Commission (Keystone, Colorado).
Chairman, Consultants Meeting on Oceanographic Modelling for London Dumping Convention, December 1976, Woods Hole, MA (International Atomic Energy Agency); U.S. Delegate, March 1977, meeting Vienna, Austria (IAEA).
Member, International Seabed Working Group (Japan, U.S., U.K., France, Canada)
Chairman, Site Selection Criteria Task Force, D.O.E. and Nuclear Energy Agency.
Member, Sandia Seabed Program/Advisory Committee (D.O.E.)
Co-Chairman, Workshop on High Energy Benthic Boundary Layer Experiment (HEBBLE), Office of Naval Research (Keystone, Colorado, March 1978).
Research Interests: Sediment dynamics in the deep sea; oceanographic factors that control sediment distribution; geologic effects of near-bottom currents; paleoenvironmental modelling of global processes of sedimentation and erosion; high energy benthic boundary layer experiments.
Author or co-author of about 40 scientific publications and three books.

Relevant Bibliography

Hollister, C.D., Flood, R.D., McCave, I.N., 1978. Plastering and decorating in the North Atlantic. Oceanus, 21:5-13.

Tucholke, B.E., Hollister, C.D., Weaver, F.M. and Vennum, W.R., 1976. Continental rise and abyssal plain sedimentation in the southeast Pacific Basin--Leg 35 Deep Sea Drilling Project. IN: Initial Reports of the Deep Sea Drilling Project, 35:359-400, U.S. Gov't Printing Office, Washington, DC.

Hollister, C.D., Southard, J.B., Flood, R.D., and Lonsdale, P.F., 1976. Flow phenomena in the Benthic Boundary Layer and bedforms beneath deep-current systems. IN: The Benthic Boundary Layer, McCave, I.N. (ed.), Plenum Press, New York, NY., 183-204.

Young, R.A. and Hollister, C.D., 1974. Quaternary sedimentation on the Northwest African continental rise, Journal of Geology, 82:675-689.

Flood, R.D., Hollister, C.D., Johnson, D.A., Lonsdale, P. and Southard, J.B., 1974. Abyssal furrows and hyperbolic echo traces on the Bahama Outer Ridge. Geology, 2:395-400.

Hollister, C.D., Johnson, D.A. and Lonsdale, P.F., 1974. Current-controlled abyssal sedimentation: Samoan Passage, Equatorial West Pacific. Journal of Geology, 82:275-299.

Tucholke, B.E., Wright, W.R. and Hollister, C.D., 1973. Abyssal circulation and its role in sedimentation on the Greater Antilles Outer Ridge. Deep-Sea Res., 20:973-996.

MacDonald, K.C. and Hollister, C.D., 1973. Near-bottom thermocline in the Samoan Passage, West Equatorial Pacific. Nature, 243:461-462.

Silva, A.J. and Hollister, C.D., 1973. Geotechnical properties of ocean sediments recovered with Giant Piston Corer 1. Gulf of Maine. J. Geophys. Res., 78:3597-3616.

Hollister, C.D. and Ewing, J.I., 1972. Regional aspects of deep sea drilling in the Western North Atlantic. IN: Initial Reports of the Deep Sea Drilling Project, 11:951-973, U.S. Gov't. Printing Office, Washington, DC.

Hollister, C.D. and Heezen, B.C., 1972. Geologic effects of ocean bottom currents. IN: Studies in Physical Oceanography--A Tribute to George Wust on his 80th Birthday, 2:37-66. A.L. Gordon (ed.), Gordon and Breach, New York, NY.

Current and Pending Support

<u>Title</u>	<u>Agency</u>	<u>M/Months</u>	<u>Dollar Amount</u>	<u>Duration</u>
Sediment Dynamics	ONR N00014-C0262 NR083-004	7.0	\$159,237	1/1/78-12/31/78
Mid-Plate, Mid-Gyre Seabed Disposal Assessment Program	Sandia Labs. Renewal Pending	4.0	\$ 97,109	10/1/77-9/30/78
WHOI Education Program		4.0	\$ 99,707	10/1/78-9/30/79
Modern Interaction between Contour Currents & Turbidity Currents on the Insular Rise of Iceland	NSF OCE76-81491	2.0	\$117,600	1/1/77-6/30/79

ROBERT CARL GROMAN
Programmer, Data Processing and Management
Research Associate

[PII Redacted]

[REDACTED]
A.B., Clark University, 1969
Dartmouth College, graduate work in physics, 1969-1971
Worcester Polytechnic Institute, pursuing M.S. degree in
Computer Science, 1977 to present

Computer and Programming Assistant, Clark University and
Worcester Polytechnic Institute, 1967-1969
Teaching Assistant, Clark University, 1968-1969
Teaching Assistant, Dartmouth College, 1969-1971

Laboratory Assistant (summer), May-September 1968;
Programmer, June-September, 1969; Research Assistant,
September 1971-1977; Research Associate, April 1977
to present, Woods Hole Oceanographic Institution

Book Review Editor, FORUM, a publication of the ACM Special
Interest Group on Information Retrieval

Publications and Technical Reports in 1977-1978

Groman, R.C. and H. Hoskins, 1977. A complete navigation and total
geomagnetic processing software package using the Hewlett-
Packard 9830 calculator. Woods Hole Oceanographic Institution
Technical Report WHOI-77-23.

MGD 77 Task Group, 1977. The Marine Geophysical Data Exchange Format -
'MGD 77', compiled by the MGD 77 Task Group, KGRD No. 10,
National Geophysical and Solar-Terrestrial Data Center,
September 1977.

DAVID ASHBY JOHNSON
Micropaleontologist
Associate Scientist

[PII Redacted]

[REDACTED]

B.S., Massachusetts Institute of Technology, 1966
M.S., Massachusetts Institute of Technology, 1966
Ph.D., Scripps Institution of Oceanography, 1971

Field Geologist, 1964, Massachusetts Institute of Technology
Laboratory Assistant, 1965, Woods Hole Oceanographic Institution
Field Geologist, 1966, Standard Oil Company of California
Postdoctoral Fellowship, 1971-1972; Assistant Scientist,
1972-1975; Associate Scientist, 1975-present, Woods Hole
Oceanographic Institution
Micropaleontologist, Deep Sea Drilling Project, Legs 22, 23, 41.

PUBLICATIONS AND TECHNICAL REPORTS (1977-1978)

McDowell, S., N. Kumar, R.D. Jacobi, D.A. Johnson and E.T. Bunce, 1977.
Regional setting of Site 357, north flank of Rio Grande Rise.
In Initial Reports of the Deep Sea Drilling Project, v. 39, 955-969.

Johnson, D.A., M. Ledbetter and L.H. Burckle, 1977. Vema Channel paleo-oceanography: Pleistocene dissolution cycles and episodic bottom water flow. *Marine Geology*, 23: 1-33.

Johnson, D.A. Cenozoic Radiolaria from the eastern tropical Atlantic, DSDP Leg 41. In Initial Reports of the Deep Sea Drilling Project, v. 41, in press.

Johnson, D.A., P. Cepek, U. Pflaumann, V. Krasheninnikov, and H. Schrader. Biostratigraphic synthesis and correlation of microfossil zonal boundaries, DSDP Leg 41. In Initial Reports of the Deep Sea Drilling Project, v. 41, in press.

Johnson, D.A., and A.H. Driscoll, 1977. Descriptions of WHOI sediment cores, vol. 5, WHOI Technical Report 77-26, 796 pp.

Johnson, D.A. and E.T. Bunce, 1977. Abyssal sediment waves in the Amirante Passage, western Indian Ocean. WHOI Technical Report 77-7, 46 pp.

Johnson, D.A. and A.N. Shor, 1977. Initial cruise report, ATLANTIS II-94, Leg 1. WHOI Technical Report 77-70, 57 pp.

CURRENT AND PENDING SUPPORT

DAVID A. JOHNSON

<u>Title</u>	<u>Agency</u>	<u>Man-Months</u>	<u>Amount</u>	<u>Dates</u>
Paleocirculation of the Western Indian Ocean	NSF OCE76-20154	8.0 6.5	\$ 36,000 \$ 35,000	Jan 1 77-Dec 31 77 Jan 1 78-Dec 31 78
Sea Floor Samples Laboratory	NSF OCE76-81488	N/C	\$ 28,000	Jan 1 78-Dec 31 78
Cenozoic Paleo-oceanography	NSF OCE77-82149	4.0	\$140,000	Nov 1 78-Oct 31 79
Sea Floor Samples Laboratory	ONR N00014-74-C-0262; NR083-004	N/C	\$ 20,000	Jan 1 78-Dec 31 78
Iceland Basin Sedimentation	NSF OCE76-81491	2.0	\$117,000	Jan 1 77-Dec 31 78

DAVID A. ROSS
Geological Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

B.S., The City College of New York, 1958
M.S., The University of Kansas, 1960
Ph.D., Scripps Institution of Oceanography, University of Calif., 1965

Member, Department of State - Ocean Affairs Advisory Committee - Marine Science Section, 1975 to present
Member, Mediterranean Panel - Deep Sea Drilling Project, 1973-78
Member, Ocean Policy Committee, National Academy of Sciences, 1977 to present
Fellow, Geological Society of America
Fellow, American Association for the Advancement of Science
Member, American Geophysical Union
Member, Society of Economic Paleontologists and Mineralogists
Member, FOSTG (Freedom of Ocean Science Task Group) and MTAC (Marine Technical Assistance Committee), National Academy of Science, 1977 to present

Research Interests: Marine geology and geophysics of marginal seas; distribution and provenance of sediments, bottom processes, cooperative research with foreign countries, marine policy

Author or co-author of approximately 90 publications in marine geology and marine geophysics
Author or editor of 6 books

Relevant Publications

Ross, D.A. and E. Uchupi, 1977. The Structure and Sedimentary History of the Southeastern Mediterranean Sea - Nile Cone Area. American Assoc. of Petroleum Geologists, Vol. 61, p. 872-902.

Ross, D.A. and L.J. Smith, Sept. 1977. Training and Technical Assistance in Marine Science: A Viable Transfer Product. In International Transfer of Marine Technology, MITSG 77-20, p. 1-46.

Ross, D.A., 1977. The Black Sea and Sea of Azov, The Mediterranean Seas, Plenum Press, p. 445-481.

Ross, D.A., E. Uchupi, C.P. Summerhayes, D.E. Koelsch, E.M. El Shazly, 1978. Sedimentation and structure of the Nile Cone and Levant Platform area. In Submarine Canyon and Fan Sedimentation Volume AAPG Symposium, Dowden, Hutchinson and Ross, Publishers, D.J. Stanley and G. Kelling (eds.), p. 261-275.

Ross, D.A., Y.P. Neprochnov, et al., 1978. Initial Reports of the Deep Sea Drilling Project, Volume 42, Part 2: Washington (U.S. Government Printing Office), 1244 pp.

Ross, D.A., 1978. Black Sea Stratigraphy. In Ross, D.A., Y.P. Neprochnov, et al., 1978. Initial Reports of the Deep Sea Drilling Project, Volume 42, Part 2: Washington (U.S. Government Printing Office), p. 17-26.

Ross, D.A., P. Stoffers and E. S. Trimonis, 1978. Black Sea Sedimentary Framework. In Ross, D.A., Y.P. Neprochnov, et al., 1978. Initial Reports of the Deep Sea Drilling Project, Volume 42, Part 2: Washington (U.S. Government Printing Office), p. 359-372.

Neprochnov, Y.P. and D.A. Ross, 1978. Black Sea Geophysical Framework. In Ross, D.A., Neprochnov, Y.P., et al., 1978. Initial Reports of the Deep Sea Drilling Project, Volume 42, Part 2: Washington (U.S. Government Printing Office), p. 1043-1055.

Ross, D.A., 1978. Summary of Results of Black Sea Drilling. In Ross, D.A., Y.P. Neprochnov, et al., 1978. Initial Reports of the Deep Sea Drilling Project, Volume 42, Part 2: Washington (U.S. Government Printing Office), p. 1149-1178.

Ross, D.A., 1978. Report D: General Data on the Geophysical Nature of the Persian Gulf and Gulf of Oman, W.H.O.I. Technical Report 78-39, 32 pages.

Ross, D.A., 1978. Freedom of Scientific Research in the Deep Sea, Oceanus, Vol. 21, no. 1, p. 69-71.

CURRENT AND PENDING SUPPORT

D.A. ROSS

<u>Title</u>	<u>Agency</u>	<u>Man/Months</u>	<u>Amount</u>	<u>Duration</u>
Geological and Geophysical Investigation of a Colliding Plate: Persian Gulf, Straits of Hormuz and the Gulf of Oman Area	NSF OCE-76-10417	10.0	\$176,400	10/15/76-9/30/79
Sea Grant Management	NOAA	5.0	\$ 98,300	7/1/78-6/30/79

IV. OCEAN ENGINEERING

DEPARTMENT OF OCEAN ENGINEERING

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Williams	Salt Fingers, Mixing and Microstructure	OE- 70

Variability of Sound Transmission Through the Ocean Interior

Dr. Robert C. Spindel
(617) 548-1400, Ext. 283

Last Two Years of Publications

R. P. Porter and R. C. Spindel, "Low Frequency Acoustic Fluctuations and Internal Gravity Waves in the Ocean", J.Acoust.Soc.Am., 61, 943-950 (1977) WHOI #3842.

R. C. Spindel, R. P. Porter and D. C. Webb, "A Mobile Coherent Low Frequency Acoustic Range", IEEE J.Oceanic Eng., OE-2, 331-337 (1977) WHOI #3901.

R. C. Spindel, R. P. Porter and J. A. Schwoerer, "Acoustic Phase Tracking of Ocean Moorings", IEEE J.Oceanic Eng., OE-3, 27-30 (1978) WHOI #3899.

R. C. Spindel, K. R. Peal and D. E. Koelsch, "A Microprocessor Acoustic Data Buoy", IEEE Oceans 78, September 1978, in press, WHOI #4168.

R. P. Porter and R. C. Spindel, "Statistics of Low Frequency Multipath Fluctuations in the Ocean", J.Acoust.Soc.Am., July 1978, in press, WHOI #3826.

R. C. Spindel and W. Munk, "Acoustic Fluctuations", Proc. of Acoustic Fluctuations Workshop, NAVEX, February 1978, in press.

ROBERT CHARLES SPINDEL
Electrical Engineer
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

B.E., Electrical Engineering, The Cooper Union, 1965
M.S., Engineering and Applied Science (E.E.), Yale University, 1966
M.Phil., Engineering and Applied Science (E.E.), Yale University,
1968
Ph.D., Engineering and Applied Science (E.E.), Yale University,
1971

Postdoctoral Research Fellow, May 1971-1972; Assistant Scientist,
May 1972-1976; Associate Scientist, May 1976 to present,
Woods Hole Oceanographic Institution

Lecturer, M.I.T./W.H.O.I. Joint Education Program
Member, Institute of Electrical and Electronic Engineers
Member, The Acoustical Society of America
Member, Tau Beta Phi
Member, W.H.O.I. Education Program Admissions Committee
Chairman, W.H.O.I. Computer Advisory Committee

Research Interests: Underwater acoustics, long range sound propagation, underwater instrumentation, correlation of acoustic and oceanographic effects, precision acoustic navigation, signal processing techniques, volume and surface scattering

Patents: Tracking System for Underwater Objects (3,928,840)
A Pulse and Doppler Underwater Acoustic Navigation System (Pending)
An Instrument for Remotely Measuring the Motion of Moored Ocean Systems (Pending)

Author or co-author of about 40 publications and Symposium presentations

DONALD E. KOELSCH
Electrical Engineer
Research Specialist
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.S. (E.E.), Texas A & M University, 1969

Electronic Technician First Class, USN, 1950-54
Oceanographic Instrumentation Technician, 1956-61
Oceanographic Instrumentation Engineer, Lamont-Doherty Geological
Observatory, 1961-65
Research Engineer, Texas A & M University, Department of Oceanog-
raphy, 1965-69
Senior Engineer, Alpine Geophysical Association Inc., 1969-71

Research Associate, June 1971-1973; Research Specialist, May 1973
to present, Woods Hole Oceanographic Institution

Member, Tau Beta Pi
Member, Eta Kappa Nu
Member, Phi Kappa Phi
Member, Instrument Society of America

Research Interests: Design and development of equipment for the
oceanographic and geophysical community; ocean bottom seis-
mographs; proton precession magnetometer; sub-bottom profilers,
and deep ocean marker beacons

Author or co-author of about 4 papers in marine geophysical
instrumentation

KENNETH R. PEAL
Computer Systems Staff Engineer
Research Associate
Woods Hole Oceanographic Institution

[REDACTED]

B.Eng., McMaster University, Hamilton, Ontario, 1964
M.A.Sc., University of British Columbia, Vancouver, 1968

VOR Systems Engineer, Department of Transport, Ottawa, 1964-65
Development Engineer, Canada Centre for Inland Waters, Burlington,
Ontario, 1968-71

Computer Systems Staff Engineer and Research Associate, August
1971 to present, Woods Hole Oceanographic Institution

Member, Association of Professional Engineers of Ontario, 1968
Member, Institute of Electrical and Electronic Engineers, 1970

Research Interests: Digital instruments, systems and software

STANLEY WENTWORTH BERGSTROM
Oceanographic Measurement Analyst
Research Associate
Woods Hole Oceanographic Institution

[REDACTED]

Lowell Institute, 1938

Motor Tester, General Electric Company, 1938-45

Research Assistant, October 1945-1963; Research Associate,
September 1963 to present, Woods Hole Oceanographic Institution

Research Interests: Underwater acoustics; Fortran programming;
sound velocimeter acoustic ray theory; analysis of under-
water sounds using Hewlett Packard computer.

Author or co-author of 3 scientific publications

MAXINE M. JONES
Computer Programmer and Systems Analyst
Research Associate
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]
B.S., (Chemistry), University of Maryland, College Park, MD, 1955

Science Teacher, Limestone, Maine, 1956-57
Chemistry Teacher, Bourne, Mass., 1957-58

Research Assistant, November 1955-56; Research Assistant, January 1958-73; Research Associate, April 1973 to present, Woods Hole Oceanographic Institution

Consultant to: Professor C. H. Chen, SMU, Mass., 1970
Dr. Pasmenteer and Mr. Gerald McNally, NYU, 1971
Dr. Ron Schlitz, Bureau of Fisheries, NOAA, 1976-77
Dr. Patrick Twohig, Bureau of Fisheries, NOAA, 1977

Research Interests: Real-time data acquisition at sea

PAUL R. BOUTIN
Research Associate
Woods Hole Oceanographic Institution

[REDACTED]
Operator of Reproduction Department, Aerovox Corporation, 1951-55
U.S. Army, NIKE Missile, 1955-57
Advanced Troop Training Specialist in Missile Tracking Radar, 1956-57
Supervisor, Production Control Specification Section, Aerovox Corporation, 1957-59
Supervisor, Quality Control Environmental Test Laboratory, MIL Approval Testing, 1959-64

Research Assistant, October 1964-1971; Research Associate, June 1971 to present, Woods Hole Oceanographic Institution

Research Interests: Design of deep water acoustic moorings (ACODAC and DIBOS), Marine E/M cables, connectors, buoyancy materials. Urethane, Neoprene and Epoxies - potting, bonding, techniques and fabrications. Hydrophone assemblies and flow shields. Administer subcontracts for shipboard modifications, acoustic winch construction, shipboard installations. Exercise planning

Co-author of Ref. 69-19, Deep-sea Corehead Camera Photography and Piston Coring; Ref. 72-87, ACODAC Ambient Noise System, and 75-47, Strumming Tests on Two Fairied Cables (October 1975)

CURRENT AND PENDING SUPPORT - R. C. SPINDEL

<u>TITLE</u>	<u>AGENCY</u>	<u>MAN/MONTHS</u>	<u>AMOUNT</u>	<u>DURATION</u>
Fluctuations and Coherence	NORDA	4	\$225,000	1/ 1/79 - 12/31/79

Volcanic and Tectonic Processes in Rift Valleys of the Mid-Ocean Ridges

Dr. Robert D. Ballard
(617) 548-1400, Ext. 224

Last Two Years of Publications

Ballard, R.D. and van Andel, Tj., 1977, FAMOUS Project, Morphology and tectonics of the inner rift valley at $36^{\circ}50'N$ on the Mid-Atlantic Ridge: Geol. Soc. of America Bull., v. 88, p. 507-530.

Ballard, R.D. and van Andel, Tj., 1977, FAMOUS Project, Operational techniques and American submersible operations: Geol. Soc. of America Bull., v. 88, p. 495-506.

Heirtzler, J.R. and Ballard, R.D., 1977, Submersible observations at the site of 332B area: Initial Reports of Deep Sea Drilling Project, leg 37, vol. XXXVII, p. 363-365.

Heirtzler, J.R., Taylor, P.T., Ballard, R.D. and Houghton, R.L., 1977, A visit to the New England Seamounts: American Scientist, v. 65, p. 466-472.

Houghton, R.L., Heirtzler, J.R. and Ballard, R.D., 1977, Submersible observations of the New England Seamounts: Naturwissenschaften, v. 64, p. 348-355.

Uchupi, E., Ballard, R.D. and Ellis, J.P., 1977, The continental slope and upper rise off western Nova Scotia and Georges Bank: Amer. Assoc. Petroleum Geologists Bull., v. 61, p. 1483-1492.

1978 or In Press

Ballard, R.D. and Uchupi, E., 1978, Volcanic and tectonic processes of the Mid-Cayman Rise: Transaction, Amer. Geophy. Union, v. 59, p. 406.

Cayrough, in press, Volcanic, tectonic and plutonic processes of the Mid-Cayman Rise: Ewing Symposium, Jour. Geophys. Res.

Cyamex, 1978, Report of diving operations on the East Pacific Rise (Project RITA), in preparation.

Corliss, J.B., Dymond, I., Gordon, L., Edmond, J.M., von Herzen, R.P., Ballard, R.D., Green, K., Williams, Bainbridge, A., Crane, K. and van Andel, Tj.H., in press, Exploration of submarine thermal springs on the Galapagos Rift: submitted to Science.

Hermes, O.D. and Ballard, R.D., Late Ordovician peralkaline granites from the Gulf of Maine: Geol. Soc. Amer. Bull.

Ballard, R.D., Holcomb, R.T. and van Andel, Tj.H., in press, The Galapagos Rift at $86^{\circ}W$, 3, Sheet flows, collapse pits, and lava lakes of the rift valley: submitted to Jour. Geophys. Res.

van Andel, Tj.H. and Ballard, R.D., in press, The Galapagos Rift at $86^{\circ}W$, 2, Volcanism, structure and evolution of the rift valley: submitted to Jour. Geophys. Res.

Crane, K. and Ballard, R.D., in press, The Galapagos Rift at $86^{\circ}W$, 4, Structure and morphology of hydrothermal fields: submitted to Jour. Geophys. Res.

BOOKS

1977:

Ballard, R.D. and Moore, J.G., 1977, Photographic Atlas of Mid-Atlantic Ridge: Springer-Verlag, New York, 114 p.

1978 or In Press

Ballard, R.D., The Ocean Depths, Chapter in Book entitled "Ocean Realm": Natl. Geographic Society Special Publications, p. 148-167.

Ballard, R.D., Life at Galapagos Rift: Science Year, World Book Encyclopedia.

Ballard, R.D., Research Submersibles: Explorers of the Ocean Depths: Yearbook of Science and the Future, Encyclopedia Britannica.

POPULAR JOURNALS

1977:

Ballard, R.D., 1977, Notes on a Major Oceanographic Find: *Oceanus*, v. 20, p. 35-44.

Corliss, J.B. and Ballard, R.D., 1977, Oasis of Life in the Cold Abyss: *Natl. Geographic Magazine*, v. 152, p. 441-453.

1978 or In Press:

Ballard, R.D., 1978, Geologen Tauchen in Den Cayman-Graben: *Bild der Wissenschaft*, März, 1978, p. 52-59.

Ballard, R.D., in press, The Galapagos Rift: *Science Supplement*, *Crolier Publishing Co.*

FILM DOCUMENTARIES

"What About Tomorrow", produced for the National Science Foundation by Harold Meyer Productions, 1978.

"Exploring the Deep Ocean Floor - The Cayman Trough", produced for the Office of the Oceanographer of the Navy by Thomas Craven Film Corporation, 1978.

"Oceanography - Project FAMOUS", produced by the British Broadcasting Corporation for Open University, 1978.

"Continental Drift", produced by the National Geographic Society for Educational Films, 1978.

CURRICULA VITARUM

ROBERT D. BALLARD
Geologist
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

B.S., University of California, (Chemistry and Geology Joint Degree), 1965
Ph.D., University of Rhode Island, 1974

U.S. Navy, (Office of Naval Research, Navy Oceanographic Liaison Officer, Northeastern United States), 1967-1970

Research Associate, November 1970-1974; Assistant Scientist, July 1974-1976; Associate Scientist, July 1976 to present, Woods Hole Oceanographic Institution

Geological Advisor to Office of the Geographer, U.S. State Department, 1977

Fellow, Geological Society of America
Member, Marine Technology Society (Chairman, Geology & Geophysics Committee)
Member, Explorers Club

Research Interests: Volcanic and tectonic processes associated with active regions of seafloor spreading through detailed investigations using submersibles and surface ships. Areas of interest have been Mid-Atlantic Ridge (Project FAMOUS), Cayman Trough, Galapagos Rift, and East Pacific Rise. Interests in the structural evolution of the Atlantic continental margins. Involved in the engineering development of both manned and unmanned near bottom advanced mapping techniques.

Author or co-author of approximately 35 scientific papers.

DAVID S. HOSOM
Engineer
Research Associate
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

E.E., University of Cincinnati, 1957
M.S.E.E., Polytechnic Institute of Brooklyn, 1963
M.S., Marine Science, Long Island University, 1971
Registered Professional Engineer - Mass., Electrical
Engineer, Avco Corporation, 1957-1958
Sperry Gyroscope Company, 1958-1961
Airborne Instruments Laboratory, 1961-1963
Grumman Aerospace Corporation, 1963-1971

Teacher, Solar Heating, Cape Cod Community College
Consultant on submersible electrical systems design for industry

Research Associate (Deep Submergence Group), July 1971 to present,
Woods Hole Oceanographic Institution

Member, Eta Kappa Nu

Research Interests: Ocean engineering in deep submersibles and
associated areas

WILLIAM M. MARQUET
Instrumentation Engineer
Research Specialist
Woods Hole Oceanographic Institution

[REDACTED]
B.S., Princeton University, 1951
M.S., Columbia University, 1952

Incremental Load Engineer, Pennsylvania Electric Company, 1952-1954
U.S. Army, 1954-1956
Automatic Guidance Field Engineer, 1955-1959; Engineering Field
Team Manager, 1959-1961; Minneapolis Honeywell, Aeronautical
Division, Consulting, study and travel, 1961-1963

Research Associate, July 1963-1970; Research Specialist, March
1970 to present, Woods Hole Oceanographic Institution

Participant in: H-Bomb search, Palomares, Spain, 1965
Azores sea mount surveys, 1968
Search and recovery of DSRV ALVIN, 1969
Project FAMOUS (French American Mid-Ocean Undersea Study) 1974
Cayman Trough Expedition, 1976
DSRV ALVIN diving experience; greater than 20 dives

Member, Marine Technology Society
Meritorious Public Service Citation, U.S. Navy

Research Interests: Deep submergence navigation and instrumentation;
Instrumentation Engineer for DSRV ALVIN and R/V LULU;
development of the portable DSRV ALVIN submerged acoustic
navigation system; study of unmanned tethered vehicles

Author or co-author of about 10 engineering articles and reports

VALENTINE PATRICK WILSON
Research Associate
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]
Special courses in U.S. Navy Schools

U.S. Navy, 1942-1964

Research Assistant, December 1964-1966; Research Associate,
December 1966 to present, Woods Hole Oceanographic
Institution

Captain, DSRV LULU, 1964-1965
Qualified Pilot, DSRV ALVIN, 1965 to present
Chief Pilot, DSRV SEA CLIFF, 1969-1970
Chief Pilot, DSRV ALVIN, 1974-1977

Charter Member, The Deep Submergence Pilots' Association
Recipient of various awards and commendations
Secretary of the Navy Commendation for outstanding
achievements during the search for, and recovery
of the lost H-Bomb off the coast of Spain

Research Interests: Operation and development of deep
submergence research vehicles, and their application
to scientific research; design, development and deploy-
ment of submerged instrumentation

EARL MASON YOUNG, JR.
Research Associate
Woods Hole Oceanographic Institution

[REDACTED]
State Technical Institute, Hartford, Connecticut, 1951-1953
University of Connecticut, Storrs, Connecticut, 1953-1954

Electrician's helper, part-time, 1950-1954
U.S. Air Force, Ground and Airborne Radio Maintenance School,
Strategic Communications Systems Installation School,
1959-1959
The Mitre Corporation, Bedford, Massachusetts, 1959-1961
Page Communications Engineers, Washington, D.C. - Installation
Supervisor, 1961-1964
Self-employed House Painter, 1964-1965

Research Assistant, January 1965-1966; Research Associate,
July 1966 to present, Woods Hole Oceanographic Institution

Research Interests: Operation, maintenance, and repair of
shipboard systems and equipment

Author or co-author of 5 Summaries of Investigation

CURRENT AND PENDING SUPPORT - R. D. BALLARD

<u>TITLE</u>	<u>AGENCY</u>	<u>MAN/MONTHS</u>	<u>AMOUNT</u>	<u>DURATION</u>
Hydrothermal Processes on the Galapagos Rise	NSF OCE77-23978	3.0	\$ 53,093	10/ 1/77 - 9/30/78
Volcano-Tectonic Evolution of Rifted Mid-Ocean Ridges	NSF OCE77-20224	6.3	259,249	12/ 1/77 - 11/30/79
Volcanic and Tectonic Processes of Accreting Plate Boundaries	ONR N00014-74-C-0262 NR-083-004	3.0	35,000	1/ 1/78 - 12/31/78
CCD Color Television System for DSRV ALVIN	National Geo- graphic Society	None	52,000 (pending)	6/ 1/78 - 6/ 1/79
East Pacific Rise at 21°N (Project RISE)	NSF (pending)	6.6	481,020	9/ 1/78 - 12/31/79

VOLCANIC AND TECTONIC PROCESSES OF ACTIVE SPREADING CENTERS

(Synthesis Program at Stanford University)

Robert D. Ballard

(617) 548-1400, Ext. 224

Introduction

A major aspect of the marine earth science program in the 1970's has centered around the detailed investigation of the mid-ocean ridge system. Understanding the structural evolution of this ridge system is critical to our overall understanding of the processes of plate tectonics which affect the structure of the entire earth. The importance of the mid-ocean ridge system to earth scientists was evidenced in January of 1972, when the National Academy of Sciences conducted a workshop at Princeton University to determine how a detailed geological and geophysical program might best be planned and organized to investigate this important geologic system. A recommendation of that workshop was to follow the present regional study programs with more detailed investigations, using deep-towed survey systems and deep submersibles. Although initial work had already begun in this direction and was providing valuable new insight into the volcanic and tectonic processes of the mid-ocean ridges, a more comprehensive effort was needed.

This comprehensive effort began in 1972 with the initiation of a joint French-American program (Project FAMOUS) to investigate, in detail, the rift valley of the Mid-Atlantic Ridge at 36°N. With the successful completion of that program in 1974, new programs of a similar fashion were carried out in the Cayman Trough, Galapagos Rift, and East Pacific Rise, as well as a revisit to the Mid-Atlantic Ridge.

By the summer of 1979, six comprehensive submersible programs will have been conducted in rift valleys of mid-ocean ridges having opening rates of slow to intermediate speed. Before beginning any new program, the Principal Investigator (who has participated in all six of these programs) believes a great deal of new insight can be gained by conducting a comprehensive synthesis of this unique data base. This proposal requests funds to partially support that synthesis effort, which will be carried out at Stanford University from September of 1979 to June of 1980. Stanford was selected for two reasons; first Dr. Tj. van Andel is on the staff, and it is with him that the Principal Investigator has been working closely since the beginning on this comprehensive study and, secondly, Stanford provides an ideal atmosphere, far from the sea-going efforts of Woods Hole, to conduct such a synthesis.

Proposed Program

The six field programs mentioned above have all taken place between June of 1974 and March of 1978, and have all been staged out of Woods Hole.

As a result, the analysis of the data collected to date has concentrated more on the unique characteristics of each rift valley setting than on a more comprehensive synthesis of the entire data base. For that reason, the Principal Investigator and Dr. van Andel have joined together to conduct such a comprehensive synthesis.

Inventory of Data Available To Date:

The principle data upon which this study will be based includes the following:

Primary Study Areas: Mid-Atlantic Ridge at 36°N, Mid-Cayman Rise, Galapagos Rift at 86°W, East Pacific Rise at 21°N.

1. Detailed bathymetric maps at an average scale of 1:8000 and 2-meter contour intervals based upon either Deep-Tow or multi-narrow beam surveys.
2. Extensive photographic coverage collected primarily by ALVIN and ANGUS, but also including photographs taken by CYANA, ARCHIMEDE, Deep-Tow, and LIBEC. Estimated total number of photographs is in excess of 250,000.
3. Dive observations obtained from ALVIN, CYANA, TRIESTE II, and ARCHIMEDE on bottom lithology and structure.
4. Structural and topographic data collected by the Deep-Tow side-scan sonar.

Secondary Study areas include:

1. Mid-Atlantic Ridge crest at 23°N investigated by van Andel and others.
2. Detailed investigation conducted by Canadians at 45°N on MAR.
3. NOAA's program in the TAGS area (26°N, MAR).
4. Bathymetric surveys of the East Pacific Rise at 9-12°S and 7-8°S on the Mid-Atlantic Ridge.
5. Deep-Tow surveys of the East Pacific Rise at 9°N.

Summary of Data Inventory from Planned Operations Prior to September 1979:

1. AMAR - Multi-narrow beam, ANGUS, and ALVIN data from the rift valley at 35°N on the Mid-Atlantic Ridge.

2. Galapagos: Multi-narrow beam, ANGUS, and ALVIN data from the rift valley east and west of earlier study at 86°W.

3. 21°N EPR: Sea Beam topographic data collected by CHARCHOT, and CYANA, ALVIN, ANGUS and Deep-Tow observations.

4. 9°N EPR: Deep-Tow data.

Analysis Program:

When the synthesis program begins at Stanford in September of 1979, the initial period of time will be spent completing the basic data analysis associated with the 1979 programs in the Galapagos Rift and East Pacific Rise. A request has been made to I.D.O.E. to cover the EPR data analysis, while funds in this proposal are requested to complete the Galapagos Rift analysis.

In addition to the data inventory listed above, requests are being made to the Ocean Survey Division of the Naval Oceanographic Office for a series of selected multi-narrow beam swath maps across the mid-ocean ridge system, where declassification is possible.

Once the final inventory of data has been accumulated, the synthesis will begin. The line of attack that will be followed is similar to that already taken by Ballard and van Andel in their earlier analysis of the Mid-Atlantic Ridge and Galapagos Rift programs (Ballard and van Andel, 1977; van Andel and Ballard, in press, Ballard, Holcomb, and van Andel, in press).

1. A topographic analysis and detailed models will be made of all the study areas at comparable scales, projections, and contour intervals. The analysis will be done at three scales ranging from kilometers to tens of meters.

2. Photographic and visual observations will then be transferred to the different topographic charts from which structural and volcanic models will be developed.

3. Emphasis of the small scale modeling will be to identify the relationship between the fundamentally different forms of under-water volcanic activity (pillow and sheet flows) and their relationship to variation in opening rates. The model proposed by Ballard and van Andel, 1977 will be tested and applied to other rift valley settings having a faster spreading rate. From this should come a better understanding of the eruptive history of the rift valley, which creates the upper layers of the oceanic crust, which are then acted upon by tectonic processes which fracture the crust and transport it up and out of the rift valley.

4. The emphasis of the large scale modeling will be on the structural evolution of the rift valley. Several models have already been proposed for the gradual increase in faulting and uplift based upon isostatic principals. A focus of our study will be to test these models and modify them according to our detailed observations.

The work we have conducted to date suggest that a genetic sequence of volcanic and tectonic events can be defined for all spreading centers which begin with volcanic processes that form oceanic crust along a narrow central zone within the rift valley and ends with their tectonic uplift to form the fault blocks bounding the valley, itself. Given such a genetic sequence, scientists working in other rift valleys can quickly determine the stages in which they are in without having to conduct as an exhaustive a survey as those that went into the construction of this model. It is also our hope that from this synthesis a better understanding can be reached as to what directions future spreading center programs should take. Finally, the book that will be published as a result of this study will bring together the data collected by the most comprehensive effort ever undertaken by deep submersibles for scientific purposes and will permit an appraisal to be made about their role and relationship to other deep-sea surveying techniques.

BUDGET JUSTIFICATION:

The P.I. will be at Stanford for a nine-month period beginning in September, 1979 and ending in June, 1980. The funds requested in this budget are for the period of time he will be there during calendar year 1979 (four months). The P.I. has also prepared a budget for 1980, which he will present at the site review. The major items in the 1979 budget deal with his salary, travel expenses, and moving expenses for this synthesis program. Other costs include the shipping of a great deal of material between Woods Hole and Stanford and graphic art services leading to the publication of the results. The trip from San Francisco to New Orleans is to visit the Ocean Survey Division of the Naval Oceanographic Office to prepare maps based upon multi-narrow beam data already collected in various study areas.

"Remote Acoustic Sensing of Naturally Occurring Suspended Particle Distributions"

Marshall H. Orr 548-1400, Ext. 288
Frederick R. Hess 548-1400, Ext. 275

Publications

1. Orr, M. H. and Hess, F. R. (1978) Remote Acoustic Monitoring of Natural Suspensate Distributions, Active Suspensate Resuspension and Slope Shelf Water Intrusions, *Journal of Geophysical Research*. (Accepted February 1978)
2. Orr, M. H., Hays, E. E., and Hess, F. R. (1978) Acoustic Detection of Demersal Fish to Within Fifteen Centimeters of the Bottom in Eighty Meters of Water, *Journal of the Fisheries Research Board of Canada*. (Accepted February 1978, will appear in the August 1978 issue)
3. Orr, M. H., and Hess, F. R. (1978) Remote Acoustic Monitoring of Industrial Chemical Waste Released at Deep Water Dump Site 106, *Journal of Geophysical Research*. (Accepted May 1978)

Papers

1. Plankton and Internal Waves: The Massachusetts Bay Experiment, Haury, L. R., Briscoe, M. G., Orr, M. H., 41st Annual Meeting, American Society of Limnology and Oceanography, 1978.
2. Orr, M. H. and Hess, F. R. (1977) Acoustic Monitoring of the Dispersion Characteristics of the Particulate Phase of Industrial Chemical Waste at Deep Water Dump Site 106. *Transactions American Geophysical Union*, 58, Fall Meeting.

MARSHALL H. ORR
Physicist
Associate Scientist
Woods Hole Oceanographic Institution

PII Redacted

[REDACTED]

B.S., University of Rhode Island, 1965
M.S., University of Maine, 1967
Ph.D., The Pennsylvania State University, 1972

Associate Scientist, 1978 to present, Woods Hole Oceanographic
Institution

Assistant Scientist, 1974-1978, Woods Hole Oceanographic Institution
Research Associate, The Applied Research Laboratory, The Pennsylvania
State University, 1973-1974

Assistant Professor of Physics, Physics Department, The Pennsylvania
State University, 1972-1973

Research and Teaching Assistant, Physics Department, The Pennsylvania
State University, 1968-1972

Instructor of Physics, Physics Department, The University of Maine,
1967-1968

Teaching Assistant, Physics Department, The University of Maine,
1965-1967

High School Physics Teacher, Guilford, Connecticut, 1964-1965

Member, The American Physical Society

Member, The American Association for the Advancement of Science

Member, American Geophysical Union

Member, Sigma Pi Sigma

Research Interests: Application of acoustic backscattering techniques
to the study of ocean mixing processes, atmospheric mixing pro-
cesses, ocean and estuary sediment transport phenomena and
environmental studies of the impact of industrial chemical waste
disposal, sewage sludge disposal and harbor dredging spoils
disposal in the ocean; application of atmospheric electricity
measurements to the study of atmospheric mixing processes;
photoacoustic effect and its application to the study of the
surface physics of materials, nuclear physics, low frequency
acoustic propagation problems.

Author or co-author of 5 scientific publications

FREDERICK ROLAND HESS
Electronic Engineer
Research Associate
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.S., University of New Hampshire, 1969

Research Specialist, 1977 to present, Woods Hole Oceanographic Institution

Research Associate, 1962-1977, Woods Hole Oceanographic Institution
Research Assistant, 1960-1962, Woods Hole Oceanographic Institution
Electronics Engineer, National Electronics Laboratories, 1959-1960
Engineering Technician, Litton Industries, 1958-1959
Laboratory Technician, University of Maryland, 1957-1958
U.S. Army, Instructor, Cryptanalysis, 1954-1957

Research Interests: Oceanographic instrumentation, especially radio buoy systems and associated telemetry; automation of data acquisition

Author of 3 papers on oceanographic instruments, and 7 papers on instruments and systems

Co-patentee of 2 patents on oceanographic devices

CURRENT AND PENDING SUPPORT - M. H. ORR and F. R. HESS

<u>TITLE</u>	<u>AGENCY</u>	<u>MAN/MONTHS</u>		<u>AMOUNT</u>	<u>DURATION</u>
Intercomparison of Internal Wave Spectra Determined from Towed Thermistor Chain Measurements and Towed Remote Acoustic Backscattering Measurements	NRL	Orr	3	\$ 98,452	10/ 1/78 - 9/30/79
		Hess	3.5		
Remote Acoustic Sensing	NORDA (in preparation)	Orr	4	\$150,000	1/ 1/79 12/31/79
		Hess	4		
Acoustic Survey of DWD 106 for Chemical Waste Plumes	NOAA Ocean Dumping Program (in preparation)	Orr	1	\$ 75,000	10/ 1/78 9/30/79
Source and Fate of Estuarine Sediments -- Boston Harbor	NOAA Sea Grant	Orr	2	\$ 20,000	7/31/78 - 6/30/78

DOUGLAS CHESTER WEBB
Sr. Research Specialist
(617) 548-1400, Ext. 425

[PII Redacted] [REDACTED]

B.S., Queens University, 1952
M.S., Manchester University, 1954

Ferranti Electric Company, Manchester, England, 1954-1956
Ing. C. Olivetti, Italy, 1956-1962

Research Assistant, November 1962-1963; Research Associate,
July 1963-1967; Research Specialist, September 1967-1973;
Senior Research Specialist, December 1973 to present,
Woods Hole Oceanographic Institution

Research Interests: Applied science, especially the development and utilization of new tools and techniques.

Author or co-author of 22 technical publications

DAVID S. BITTERMAN, JR.
Research Associate
(617) 548-1400, Ext. 445

[REDACTED]
B.S. (E.E.) Massachusetts Institute of Technology, 1965
M.S. (E.E.) University of California, 1966

Instrumentation and Communications Systems Engineer, General Electric Company, 1966-70.

Research Associate, June 1970 to present, Woods Hole Oceanographic Institution

Engineer in charge of design and construction of ACODAC Electronics, Inverted Echo Sounders

Research Interests: Electronic engineering; design and development of oceanographic instrumentation, data and acoustic systems.

Author of 3 scientific publications

Other Funding (pending)

1. Office of Naval Research
WHOI Proposal #1315
"A Study of the National Needs for Electronic Recording of
XBT Data"
Amount requested: \$28,530
D.C. Webb, Principal Investigator
Duration: 8 months

2. National Science Foundation
WHOI Proposal #1170
"POLYMODE Float Program"
Amount requested: \$2,461,937
D.C. Webb and W.J. Schmitz, Co-Principal Investigators
Duration: 48 months

ALBERT J. WILLIAMS 3rd
Associate Scientist
(617) 548-1400, Ext. 456

[REDACTED]

B.A., Swarthmore College, 1962
Ph.D., Johns Hopkins University, 1969

Research Assistant, Johns Hopkins University, 1963-1968

Postdoctoral Investigator, March 1969-1971; Assistant Scientist, March 1971-1975; Associate Scientist, April 1975 to present, Woods Hole Oceanographic Institution

Member, American Geophysical Union
Member, American Association for the Advancement of Science

Research interests: Ocean microstructure; mixing and thermo-haline convection; benthic boundary layer flows; oceanographic, electronic, and optical instrumentation

Author or co-author of 13 publications, including papers in the fields of electron spectroscopy, ocean microstructure, and oceanographic instrumentation.

Significant Publications

1. Tochko, J.S. (1978). Study of the velocity structure in a marine boundary layer: Instrumentation and observation. Unpublished Dissertation. MIT/WHOI Joint Program in Oceanography, Woods Hole, MA, 187 pp.
2. Williams, A.J. 3rd and J.S. Tochko, (1977). "An Acoustic Sensor of Velocity for Benthic Boundary Layer Studies," In: Bottom Turbulence, Proc. 8th Internat. Liege Colloquium Ocean Hydrodynam., Elsevier Oceanogr. Ser. 19, Jaques C.J. Nihoul, Ed., Elsevier Sci. Pub. Co., Amsterdam-Oxford-New York, pp 83-97.

Other Funding

1. National Science Foundation
WHOI Proposal # 1036.1
"Combined Wave and Current Processes in the Coastal Environment"
Amount requested: \$57,600
William D. Grant & A.J. Williams, Co-Principal Investigators
Proposed duration: 12 months
2. Sea Grant
WHOI Proposal #1198
"Moveable Bed Roughness in the Coastal Zone: A Field Study and Model Design"
Amount requested: \$93,500
William D. Grant & A.J. Williams, Co-Principal Investigators
Proposed duration: 12 months

ALBERT J. WILLIAMS 3RD
Associate Scientist
(617) 548-1400, Ext. 456

[PII Redacted] [REDACTED]

B.A., Swarthmore College, 1962
Ph.D., Johns Hopkins University, 1969

Research Assistant, Johns Hopkins University, 1963-1968

Postdoctoral Investigator, March 1969-1971; Assistant Scientist,
March 1971-1975; Associate Scientist, April 1975 to present,
Woods Hole Oceanographic Institution

Member, American Geophysical Union
Member, American Association for the Advancement of Science

Research interests: Ocean microstructure; mixing and thermohaline
convection; benthic boundary layer flows; oceanographic, electronic,
and optical instrumentation

Author or co-author of 13 publications, including papers in the fields
of electron spectroscopy, ocean microstructure, and oceanographic
instrumentation

Significant Publications

1. "The effects of rotation on salt fingers," Raymond W. Schmitt, Jr. and R.B. Lambert, submitted to J. of Fluid Mechanics.
2. "The growth rate of supercritical salt fingers," Raymond W. Schmitt, Jr. Submitted to Deep-Sea Research.
3. "An estimate of the vertical mixing due to salt fingers based on observations in the North Atlantic Central Waters," Raymond W. Schmitt and David L. Evans, submitted to J. of Geophysical Research.
4. "Interpretation of velocity profiles measured by freely sinking probes," Peter J. Hendricks and George Rodenbusch, submitted to Deep-Sea Research.

Other Funding

1. National Science Foundation
WHOI Proposal #1036.1
"Combined Wave and Current Processes in the Coastal Environment"
Amount requested: \$57,600
William D. Grant and A.J. Williams, Co-Principal Investigators
Proposed duration: 12 months
2. Sea Grant
WHOI Proposal #1198
"Moveable Bed Roughness in the Coastal Zone: A Field Study and Model Design"
Amount requested: \$93,500
William D. Grant and A.J. Williams, Co-Principal Investigators
Proposed duration: 12 months

V. PHYSICAL OCEANOGRAPHY

PHYSICAL OCEANOGRAPHY

Table of Contents

<u>Title</u>	<u>Principal Investigator</u>
Introduction	
Budget Summary	
1. Pycnostadal Analyses of the Upper Water Masses and Circu- lation of the World's Oceans	Michael S. McCartney
2. Temperature Measurements with XBTs in the Northwestern Indian Ocean (an INDEX Proposal)	John G. Bruce and Bruce A. Warren
3. Oceanic Variability and Dynamics	Thomas B. Sanford
4. Large-Scale Circulation	Bruce A. Warren
5. Water Mass Formation and World Water Mass Census	Valentine Worthington
6. Oceanic Fronts	Arthur D. Voorhis
7. Spatial Spectra and Coherence in the Internal Wave Band	Eli Joel Katz

Other Support for Principal Investigators and Senior
Personnel

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McCartney	Pycnostadal Analyses of the Upper Water Masses and Circulation of the World's Oceans
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Bruce, Warren	Temperature Measurements with XBTs in the Northwestern Indian Ocean (an INDEX Proposal)
	PO-16
Sanford	Oceanic Variability and Dynamics . . .
	PO-31
Warren	Large-Scale Circulation
	PO-48
Worthington	Water Mass Formation and World Water Mass Census
	PO-60
Voorhis	Oceanic Fronts
	PO-66
Katz	Spatial Spectra and Coherence in the Internal Wave Band
	PO-70
Other Support for Principal Investigators and Senior Personnel	PO-71

1. PYCNOSTADAL ANALYSES OF THE UPPER WATER MASSES
AND CIRCULATION OF THE WORLD'S OCEANS

Michael S. McCartney

(617) 548-1400, ext. 530

Bibliography (1977-1978)

McCartney, M. S., 1977.
Subantarctic mode water. In: A Voyage of Discovery,
George Deacon 70th Anniversary Volume, M. V. Angel,
editor, Supplement to Deep-Sea Research, 24, 103-119.

McCartney, M. S., L. V. Worthington and W. J. Schmitz, Jr.,
1978.

Large cyclonic rings from the northeast Sargasso Sea.
Journal of Geophysical Research, 83(C2), 901-914.

MICHAEL SCOTT McCARTNEY
Physical Oceanographer
Assistant Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]
B.S., Case Institute of Technology, 1970
M.S., Case Western Reserve University, 1972
Ph.D., Case Western Reserve University, 1973

Draftsman, summer 1968, Flodar Corporation, Cleveland, Ohio
Draftsman, summer 1969, Bell Aerosystems, Cleveland, Ohio
Graduate Assistant, summer 1970; NSF Trainee, 1970-71;
Graduate Assistant, 1971-73; Postdoctoral Research
Associate, 1973, Case Western Reserve University
Summer Student Fellow in Geophysical Fluid Dynamics, 1972;
Postdoctoral Scholar, 1973-74; Postdoctoral Investigator,
1974-75; Assistant Scientist, 1975--, Woods Hole
Oceanographic Institution

Member, International Southern Ocean Studies (ISOS)
Executive Committee, 1975--

Research Interests: Dynamics of the general circulation of the oceans: effects of bottom topography on current structure; processes for water mass formation and renewal; integral momentum and energy balances.

Descriptive physical oceanography: distribution and circulation paths and intensities of water masses, particularly those originating in the polar and sub-polar zones.

Author or co-author of 4 refereed scientific publications

2. TEMPERATURE MEASUREMENTS WITH XBTs IN THE NORTHWESTERN
INDIAN OCEAN (an INDEX Proposal)

John G. Bruce
(617) 548-1400, ext. 505

Bruce A. Warren
(617) 548-1400, ext. 537

Bibliography (1977-1978)

Bruce, J. G., 1977.
Somali Current: recent measurements during the southwest monsoon. Science, 197, 51-53.

Katz, Eli Joel and collaborators (J. Bruce included), 1977.
Zonal pressure gradient along the equatorial Atlantic.
Journal of Marine Research, 35(2), 293-307.

Bruce, J. G., 1978.
Spatial and temporal variation of the wind stress off the Somali Coast. Journal of Geophysical Research, 83 (C2), 963-967.

Katz, Eli J., John G. Bruce and Brian D. Petrie,
Salt and mass flux in the Atlantic Equatorial Undercurrent. Deep-Sea Research, submitted.

JOHN GOODALL BRUCE, JR.
Oceanographer
Research Associate
Woods Hole Oceanographic Institution

[PII Redacted]

B.S., Virginia Polytechnic Institute, 1951
M.S., Virginia Polytechnic Institute, 1953
University of Liverpool on Fulbright Scholarship

Research in ballistics, 1952-54, Hercules Powder Company
Research Associate, 1954 to present, Woods Hole
Oceanographic Institution

Research Interests: Indian Ocean circulation in summer
and winter monsoons

Author or co-author of 17 refereed scientific publications

BRUCE ALFRED WARREN
Physical Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted] [REDACTED]

B.A., Amherst College, 1958
Ph.D., Massachusetts Institute of Technology, 1962

Research Assistant, 1962-63; Assistant Scientist, 1963-67;
Associate Scientist, 1967 to present, tenure awarded
in 1972, Woods Hole Oceanographic Institution

Member, Executive Committee for International Southern
Ocean Studies
Associate Editor, Journal of Physical Oceanography

Research Interests: Dynamics of ocean currents; water-
mass structures; general oceanic circulation

Author or co-author of 24 scientific publications in
physical oceanography, plus miscellany

3. OCEANIC VARIABILITY AND DYNAMICS

Thomas B. Sanford

(617) 548-1400, ext. 549

Bibliography (1977-1978)

Sanford, Thomas B., 1977.

Measurements by geomagnetic induction of volume transport in a salt marsh drainage channel. Limnology and Oceanography, 22(6), 1082-1089.

Sanford, Thomas B., 1977.

Design concepts for a shallow water velocity profiler and a discussion of a profiler based on the principles of geomagnetic induction. Bericht aus dem Institut für Meereskunde an der Universität Kiel, Nr. 30, 27 pp.

Sanford, Thomas B. and Nelson G. Hogg, 1977.

The North Atlantic fine and microstructure cruise Knorr 52 and Eastward 75-12. W.H.O.I. Ref. No. 77-11 (unpublished manuscript), 88 pp.

Johnson, Charles Leslie, 1977.

The separation of wave-induced and intrusive fine structure. Ph.D. Dissertation, Scripps Institution of Oceanography, University of California at San Diego.

Hogg, Nelson G., Eli J. Katz and Thomas B. Sanford, 1978.

Eddies, islands and mixing. Journal of Geophysical Research, 83(6), 2921-2938.

Sanford, Thomas B., Robert G. Drever and John H. Dunlap, 1978.

A velocity profiler based on the principles of geomagnetic induction. Deep-Sea Research, 25, 183-210.

Sanford, Thomas B., Robert G. Drever and John H. Dunlap, 1978.

Deep-ocean velocity profiles from electromagnetic and acoustic Doppler measurements. In: Proceedings of the Working Conference on Current Measurements, University of Delaware, 11-13 January 1978, W. E. Woodward, editor, NOAA, in press.

Dunlap, John H., Thomas B. Sanford and Robert G. Drever, 1978.

Performance of an absolute velocity profiler based on acoustic Doppler and electromagnetic principles.

W.H.O.I. Ref. No. 78-28 (unpublished manuscript), 60 pp.

Johnson, Charles Leslie, C. S. Cox and B. Gallagher,
The separation of wave-induced and intrusive fine structure. Journal of Physical Oceanography, accepted.

Cox, C. S., and C. L. Johnson,
Inter-relations of microprocesses, internal waves, and
large scale ocean features. Journal of Geophysical
Research, submitted.

Gargett, A. E., T. B. Sanford and T. R. Osborn,
Surface mixing layers in the Sargasso Sea. Journal of
Physical Oceanography, submitted.

Hogg, Nelson G.,
Island trapped waves: Theory and observations from around
Bermuda. Journal of Physical Oceanography, submitted.

Historical Funding

The Office of Naval Research has funded this program
from its inception in 1968.

THOMAS BAYES SANFORD
Physical Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted] [REDACTED]

A.B., Oberlin College, 1962
Ph.D., Massachusetts Institute of Technology, 1967

Physicist, 1962-63, N.A.S.A., Lewis Research Center,
Cleveland, Ohio
Research Assistant, 1963-66; Instructor, 1966-67, Massa-
chusetts Institute of Technology
Assistant Scientist, 1967-71; Associate Scientist, 1971
to present, Woods Hole Oceanographic Institution

A. F. Bulgin Premium, Institution of Electronic and Radio
Engineers, London, England, 1971
U.S. Patent no. 3,738,164, "Measurements Pertaining to Ocean
Currents by Geomagnetic Induction," 1973

Research Interests: Measurement and interpretation of
motionally-induced electric and magnetic fields in the
deep sea and within channels; structure and dynamics
of ocean currents, eddies and waves; generation, prop-
agation and dissipation of internal waves and micro-
structure; magnetotelluric studies in the deep sea;
development of oceanographic sensors and instrumentation

Author or co-author of 11 refereed scientific publications

CHARLES LESLIE JOHNSON
Physical Oceanographer
Postdoctoral Investigator
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.Sc., Harvey Mudd College, 1970
University of California at Santa Barbara, 1970-71
Ph.D., Scripps Institution of Oceanography, University
of California at San Diego, 1977

Research Assistant, 1973-77, Scripps Institution of
Oceanography

California State Scholarship, 1966-70; Achievement
Rewards for College, Scientists Fellowship, 1971-72;
San Diego Fellowship, 1971-72.

Research Interests: Passive and dynamic microprocesses
in the ocean thermocline; statistics (spatial and
temporal probabilities) of mixing events in the ocean

Author or co-author of 2 refereed scientific publications

JOHN H. DUNLAP
Data analyst and manager
Research Associate
Woods Hole Oceanographic Institution

[REDACTED]

B.S., Electrical Engineering, University of Rochester,
1969, specializing in communications and numerical
analysis

Engineering Aid, Xerox Corporation, summer, 1966
Engineering Aid, Raytheon Corporation, summer, 1967
Computer Programmer, University of Rochester, River
Campus Station, part time, 1968-69
Engineer, Grumman Aerospace Corporation, 1969-70
Research Assistant, 1970-73; 1974-76; Research Associate,
1976--, Woods Hole Oceanographic Institution

Research Interests: Improvement and development of data
acquisition and data processing for velocity profilers

Co-author of 5 publications and technical reports

4. LARGE-SCALE CIRCULATION

Bruce A. Warren

(617) 548-1400, ext. 537

Bibliography (1977-1978)

Warren, Bruce A., 1977.

Deep western boundary current in the eastern Indian Ocean. Science, 196(4285), 53-54.

Warren, Bruce A., 1977.

Shapes of deep density-depth curves. Journal of Physical Oceanography, 7(3), 338-344.

Warren, Bruce A., 1977.

Note on interpreting e-folding depth. A Voyage of Discovery (M. Angel, editor), Deep-Sea Research, Supplement to 24, 157-163.

Warren, Bruce A., 1978.

Bottom water transport through the Southwest Indian Ridge. Deep-Sea Research, 25(3), 315-321.

Clarke, R. Allyn, Robert F. Reiniger, and Bruce A. Warren.

Current system south and east of the Grand Banks of Newfoundland. Submitted to Deep-Sea Research.

BRUCE ALFRED WARREN
Physical Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted] [REDACTED]

B.A., Amherst College, 1958
Ph.D., Massachusetts Institute of Technology, 1962

Research Assistant, 1962-63; Assistant Scientist, 1963-67;
Associate Scientist, 1967 to present, tenure awarded
in 1972, Woods Hole Oceanographic Institution

Member, Executive Committee for International Southern
Ocean Studies
Associate Editor, Journal of Physical Oceanography

Research Interests: Dynamics of ocean currents; water-
mass structures; general oceanic circulation

Author or co-author of 24 scientific publications in
physical oceanography, plus miscellany

5. WATER MASS FORMATION AND
WORLD WATER MASS CENSUS
Valentine Worthington
(617) 548-1400, ext. 487

Bibliography (1977-1978)

Bunker, Andrew F., 1977.
Structure, turbulence, fluxes and transformations of a maritime cold front during AMTEX. Journal of the Meteorological Society of Japan, 55(6), 586-605.

McCartney, M. S., 1977.
Subantarctic Mode Water. In: A Voyage of Discovery, George Deacon 70th Anniversary Volume, M. V. Angel, editor, Supplement to Deep-Sea Research, 24, 103-119.

Worthington, L. V., 1977.
The case for near-zero production of Antarctic Bottom Water. Geochimica et Cosmochimica Acta, 41, 1001-1006.

Worthington, L. V., 1977.
Intensification of the Gulf Stream after the winter of 1976-1977. Nature, 270(5636), 415-417.

Leetmaa, Ants and Andrew F. Bunker, 1978.
Updated charts of the mean annual wind stress, convergences in the Ekman layers, and Sverdrup transports in the North Atlantic. Journal of Marine Research, 36(2), 311-322.

McCartney, M. S., L. V. Worthington and W. J. Schmitz, Jr., 1978.
Large cyclonic rings from the northeast Sargasso Sea. Journal of Geophysical Research, 83(C2), 901-914.

Richardson, P. L., R. E. Cheney and L. V. Worthington, 1978.
A census of Gulf Stream rings, Spring 1975. Journal of Geophysical Research, in press.

VALENTINE WORTHINGTON
Physical Oceanographer
Senior Scientist
Chairman, Department of Physical Oceanography
Woods Hole Oceanographic Institution

PII Redacted

Princeton University, 1938-41

U.S. Navy, 1943-46

Technician, 1941-43, 1946-51; Research Associate, 1951-58;
Physical Oceanographer, 1958-63; Senior Scientist, 1963
to present, Chairman, Department of Physical Oceanography,
1974--, Woods Hole Oceanographic Institution

Research Interests: Atlantic circulation; deep water;
Caribbean Sea; Kuroshio; Arctic; water mass formation

Author or co-author of 33 refereed scientific publications

ANDREW FRANK BUNKER

Meteorologist
Associate Scientist
Woods Hole Oceanographic Institution

B.A., Ohio Wesleyan University, 1938

M.A., University of Toronto, 1940

Certificate of Meteorology, University of California at
Los Angeles (U.S. Army Air Corps), 1943

Certificate in Meteorology, University of Chicago
(U.S. Army Air Corps), 1943

Meteorological Officer, 1943-45, U.S. Army Air Corps
Tester, 1946, Dairy Herd Improvement Association,
University of New Hampshire

Research Associate, 1946-50; Marine Meteorologist, 1950-51;
Meteorologist, 1951-63; Associate Scientist, 1963 to
present, Woods Hole Oceanographic Institution

Adjunct Associate Professor of Oceanography, New York
University, 1960-64

Consultant, U. S. Weather Bureau, 1962-64

Director, West Falmouth Library

Troop Committee Member, Troop 38, Boy Scouts of America

Research in meteorology: Studies in atmospheric turbulence
and diffusion of heat, water vapor, and momentum over
the oceans; modification of air masses; cloud distributions

Author or co-author of 21 refereed scientific publications in
astrophysics and meteorology

6. OCEANIC FRONTS

Arthur D. Voorhis

(617) 548-1400, ext. 532

Bibliography of Papers on Oceanic Fronts by the Principal Investigator

Voorhis, A. D. and J. B. Hersey, 1964.
Oceanic thermal fronts in the Sargasso Sea. Journal of Geophysical Research, 69, 3809-3814.

Voorhis, A. D., 1969.
The horizontal extent and persistence of thermal fronts in the Sargasso Sea. Deep-Sea Research, Supplement to 16, 331-337.

Voorhis, A. D. and E. H. Schroeder, 1976.
The influence of deep mesoscale eddies on the sea surface temperature in the North Atlantic subtropical convergence. Journal of Physical Oceanography, 6, 953-961.

Voorhis, A. D., D. C. Webb and R. C. Millard, 1976.
Current structure and mixing in the shelf/slope water front south of New England. Journal of Geophysical Research, 81, 3695-3708.

Leetmaa, A. and A. D. Voorhis,
Scales of motion in the subtropical convergence zone.
Journal of Geophysical Research, Oceanic Fronts, in press.

ARTHUR D. VOORHIS
Physical Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

PII Redacted

[REDACTED]

B.A., Cornell University, 1948
Ph.D., Yale University, 1954

Assistant, 1948-49; Assistant in Research, 1952-53, Yale University
Research Physicist, 1954-57, Westinghouse Electric Corporation
Research Associate, 1957-63; Associate Scientist, 1963 to present, Woods Hole Oceanographic Institution

Research in Physics: Low temperature physics, second sound transmission in liquid He II; neutron diffusion in reactors

Research in Oceanography: Hydrodynamics, internal waves and temperature fluctuations; thermal fronts at the sea surface; Gulf Stream; turbulence; underwater sound; meso-scale oceanic motions.

Author or co-author of 15 refereed scientific publications in physical oceanography, underwater sound, and neutron diffusion problems

7. SPATIAL SPECTRA AND COHERENCE IN THE INTERNAL WAVE BAND

Eli Joel Katz

(617) 548-1400, ext. 534

Bibliography (1977-1978)

Katz, Eli Joel and Collaborators, 1977.
Zonal pressure gradient along the equatorial Atlantic.
Journal of Marine Research, 35(2), 293-307.

Hogg, Nelson G., Eli J. Katz and Thomas B. Sanford,
Eddies, islands and mixing.
Journal of Geophysical Research, in press.

Katz, Eli J., John G. Bruce and Brian D. Petrie,
Salt and mass flux in the Atlantic Equatorial Undercurrent.
Deep-Sea Research, submitted.

Katz, Eli Joel and Warren E. Witzell, Jr.,
A depth controlled tow system for hydrographic and current measurements with applications.
Deep-Sea Research, submitted.

ELI JOEL KATZ
Physical Oceanographer
Associate Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

[REDACTED]

B.S.M.E., Polytechnic Institute of Brooklyn, 1957
M.S., Pennsylvania State University, 1959
Ph.D., The Johns Hopkins University, 1962

Postdoctorate, 1962-63, The Johns Hopkins University
Lecturer, 1963-65, The Hebrew University of Jerusalem
(Israel)
Research Specialist, 1965-66, General Dynamics/Electric
Boat
Visiting Senior Lecturer, 1969-70, Tel Aviv University
Assistant Scientist, 1966-68; Associate Scientist, 1968
to present, Woods Hole Oceanographic Institution

Research Interests: Ocean dynamics and circulation.
Presently studying aspects of internal gravity waves,
oceanic fronts, and the Atlantic Equatorial Undercurrent.

Author or co-author of 19 refereed scientific publications

Other Support for Principal Investigators and Senior Personnel

<u>Contracts and Grants</u>			Months of Effort	Dollar Amount	Dates
Name	Title	Number			
J. Bruce B. Warren	Temperature Measurements with XBTs in the Northwestern Indian Ocean (an INDEX proposal) (J. Bruce & B. Warren, Co-Principal Investigators)	ONR N00014-74-C0262 NR 083-004	7 0	\$50,000	January 1, 1978 to December 31, 1978
B. Warren	Large Scale Circulation	ONR N00014-74-C0262 NR 083-004	9	\$55,473	January 1, 1978 to December 31, 1978
B. Warren	Panulirus Hydrographic Stations (B. Schroeder, Co-Principal Investigator)	NSF ATM77-22814	0	\$60,900	November 1, 1977 to October 31, 1979
A. Bunker	Assembly and Analysis of a Climate Data Set of North and South Atlantic Surface Energy Fluxes and Meteorological Variables	NSF ATM77-01475	12	\$96,000	April 1, 1977 to March 31, 1979
A. Bunker V. Worthington	Water Mass Formation and World Water Mass Census (V. Worthington, Principal Investigator)	ONR N00014-74-C0262 NR 083-004	6 3	\$100,000	January 1, 1978 to December 31, 1978
V. Worthington	The Flow of Bottom Water Between the North and South Atlantic (J. Whitehead, Co-Principal Investigator)	NSF OCE77-07507	3	\$284,200	July 1, 1977 to June 30, 1979
V. Worthington M. McCartney	Patterns and Processes in the Physics and Biology of the Northern Sargasso Sea in Spring 1979 (V. Worthington, P. Wiebe & H. Stommel, Co-Principal Investigators)	NSF (Pending)	0	\$439,578	October 1, 1978 to September 30, 1979
M. McCartney B. Warren V. Worthington	International Southern Ocean Studies (ISOS): Water Mass Renewal and Circulation Studies South of New Zealand	NSF/IDOE	9 2 0	\$316,300	December 1, 1977 to December 31, 1978
M. McCartney	Theoretical Modeling of Current-Bottom Topography Interactions in the Southern Ocean (ISOS)	NSF/IDOE OCE76-00390	10	\$48,100	February 1, 1976 to January 31, 1978
M. McCartney	Thermostadial Analysis of the Upper Water Masses and Circulation of the World Ocean	ONR N00014-74-C0262 NR 083-004	3	\$23,216	January 1, 1978 to December 31, 1978
M. McCartney	Equipment Request for Support of the W.H.O.I. CTD Group Operations (M. McCartney & R. Millard, Co-Principal Investigators)	NSF (Pending)	0	\$84,885	October 1, 1978 to September 30, 1979
T. Sanford	Oceanic Variability and Dynamics	ONR N00014-74-C0262 NR 083-004	4	\$108,000	January 1, 1978 to December 31, 1978
T. Sanford	Development and Testing of an Expendable Temperature and Velocity Profiler Based on the Principles of Geomagnetic Induction	NORDA N00014-77-C0422 NR 704-106	1	\$150,000	February 1, 1978 to December 31, 1978
T. Sanford	A Study of the Vertical Structure and Energy of Mid-Ocean Eddies Using Electromagnetic and Doppler Velocity Profilers	NSF/IDOE OCE76-24605	10	\$324,600	February 1, 1977 to January 31, 1979
M. McCartney V. Worthington	W.H.O.I. Education Program		1-2		Academic Years 1978-79 & 1979-80

VI. GULF STREAM RINGS

INTERDISCIPLINARY STUDIES

TEXT

Table Of Contents

Richardson	Cyclonic Gulf Stream Rings	GSR-1
Wiebe	The Biology of Gulf Stream Cold-Core Rings	GSR-9
Backus	Mesopelagic Fishes in Cold-Core Gulf Stream Rings	GSR-29

CYCLONIC GULF STREAM RINGS

Philip L. Richardson

(617) 548-1400, ext. 546

Historical Funding Information in Support of Ring Program

The Office of Naval Research provided support from 1971 to 1974 to P. Richardson at the University of Rhode Island to analyze the early ring tracking and decay data (Richardson, Strong and Knauss, 1973; Cheney and Richardson, 1976). From 1974 to 1976 ONR funded an analysis of historical data from the National Oceanographic Data Center and Fleet Numerical Weather Central to document the number and movement of rings (Lai and Richardson, 1977). Recently, during 1976-1977, ONR funded part of the interdisciplinary ring experiment.

In the late sixties and early seventies ONR provided support for measurements of the transport and velocity structure of the Gulf Stream and Western Boundary Undercurrent (Richardson and Knauss, 1971; Richardson, 1977). The Gulf Stream ring work evolved from these experiments.

Bibliography (1977-1978 plus those mentioned above)

Cheney, R. E. and P. L. Richardson, 1976.

Observed decay of a cyclonic Gulf Stream ring. Deep-Sea Research, 23(2), 143-155.

Johnson, David L. and Philip L. Richardson, 1977.

On the wind-induced sinking of Sargassum. Journal of Experimental Marine Biology and Ecology, 28, 255-267.

Lai, David Y. and Philip L. Richardson, 1977.

Distribution and movement of Gulf Stream rings. Journal of Physical Oceanography, 7(5), 670-683.

Richardson, Philip L., 1977.

On the crossover between Gulf Stream and western boundary undercurrent. Deep-Sea Research, 24, 139-159.

Richardson, P. L., 1978.

Tracking Gulf Stream rings with free-drifting satellite buoys. Transactions, American Geophysical Union, 59, 301 (abstract).

Richardson, P. L., R. E. Cheney and L. A. Mantini, 1977.

Tracking a Gulf Stream ring with a free drifting surface buoy. Journal of Physical Oceanography, 7(4), 580-590.

Richardson, P. L., R. E. Cheney and L. V. Worthington, 1978.
A census of Gulf Stream rings, spring 1975. Journal of Geophysical Research, in press.

Richardson, P. L. and J. A. Knauss, 1971.
Gulf Stream and western boundary undercurrent observations at Cape Hatteras. Deep-Sea Research, 18, 1089-1109.

Richardson, P. L., A. E. Strong and J. A. Knauss, 1973.
Gulf Stream eddies: recent observations in the western Sargasso Sea. Journal of Physical Oceanography, 3, 297-301.

PHILIP L. RICHARDSON
Physical Oceanographer
Assistant Scientist
Woods Hole Oceanographic Institution

PII Redacted

[REDACTED]

B.S., Civil Engineering, University of California, 1964
M.S., Physical Oceanography, University of Rhode Island,
1970
Ph.D., Physical Oceanography, University of Rhode Island,
1974

Officer, U.S. Coast and Geodetic Survey, USESSA, 1964-66,
Rockville, Maryland
Graduate Assistant, 1967-69; Research Assistant, 1969-73;
Assistant Professor of Oceanography, 1973-74, Graduate
School of Oceanography, University of Rhode Island,
Kingston, Rhode Island
Assistant Scientist, 1974--, Woods Hole Oceanographic
Institution

Member, American Association for the Advancement of
Science, American Geophysical Union, American Meteorological Society

Research Interests: The general ocean circulation, the
transport and velocity structure of the Gulf Stream
and Western Boundary Undercurrent, the distribution,
movement and decay of Gulf Stream rings

Author or co-author of 11 refereed scientific publications

Current Support and Pending Applications of Philip L. Richardson

<u>Contracts and Grants</u>		Months of Effort	Dollar Amount	Dates
Title	Number			
Cyclonic Gulf Stream Rings	ONR N00014-74-C0262 NR 083-004	7	\$51,000	January 1, 1978 to December 31, 1978
Hydrographic Studies of a Gulf Stream Cyclonic Ring	NSF OCE76-82059	6	\$61,000	January 1, 1977 to December 31, 1978
A Study of the Gulf Stream Using Satellite-Tracked, Drogued Surface Buoys	NSF OCE77-08045	1	\$34,000	May 1, 1977 to April 30, 1978
	Pending	4	\$29,233	November 1, 1978 to October 31, 1979

THE BIOLOGY OF GULF STREAM COLD CORE RINGS

Peter H. Wiebe

[PII Redacted]

Publications of Past Two Years for the Principal Investigator

1976 Wiebe, P. H., K. H. Burt, S. H. Boyd, and A. W. Morton. A multiple opening/closing net and environmental sensing system for sampling zooplankton. *J. Mar. Res.* 34(3): 313-326.

1976 Wiebe, P. H., S. H. Boyd and C. Winget. Particulate matter sinking to the deep-sea floor at 2000 m in the Tongue of the Ocean, Bahamas with a description of a new sedimentation trap. *J. Mar. Res.* 34(3): 341-354.

1976 Cox, J. and P. H. Wiebe. Denitrification in Bahia Darwin (Galapagos Islands) an intermittent anoxic basin in the tropics. *Hydrobiologia* 50(2): 123-127.

1976 Wiebe, P. H., E. M. Hulbert, E. J. Carpenter, A. E. Jahn, G. P. Knapp, III, S. H. Boyd, P. B. Ortner and J. L. Cox. Gulf Stream cold core rings: large scale interaction sites for open ocean planktonic communities. *Deep-Sea Res.* 23: 695-710.

1976 Haury, L. R., P. H. Wiebe, and S. H. Boyd. Longhurst-Hardy plankton recorder systems: design and use to minimize bias. *Deep-Sea Res.* 23: 1217-1229.

1976 Wiebe, P. H. The Biology of Cold-Core Rings. *Oceanus* 19(3): 69-76.

1978 Wiebe, P. H. and S. Boyd. Limits of *Nematoscelis megalops* in the Northwestern Atlantic in relation to Gulf Stream cold-core rings. Part I. Horizontal and vertical distributions. *J. Mar. Res.* 36: 119-142.

1978 Boyd, S. H., P. H. Wiebe and J. L. Cox. Limits of *Nematoscelis megalops* in the Northwestern Atlantic in relation to Gulf Stream cold-core rings. Part II. Physiological and biochemical effects of expatriation. *J. Mar. Res.* 36: 143-159.

1978 Ortner, P. B., P. H. Wiebe, L. R. Haury and S. H. Boyd. Variability in zooplankton biomass distribution in the Northern Sargasso Sea: the contribution of Gulf Stream cold-core rings. *Fish. Bull.* 76: 323-334.

In Press

Haury, L. R., J. A. McGowan and P. H. Wiebe. Patterns and processes in the time-space scales of plankton distributions. In Spatial Pattern in Plankton Communities, J. H. Steele [ed.], pp. 277-327.

Cox, J. L. and P. H. Wiebe. Origins of plankton in the middle Atlantic Bight. Accepted with revision at J. Est. & Coast. Mar. Sci.

Submitted

Wiebe, P. H., L. P. Madin, L. R. Haury, G. R. Harbison and L. M. Philbin. Diel vertical migration by *Salpa aspera* and the potential for large-scale particulate organic matter transport to the deep-sea. Submitted to Marine Biology

In Manuscript

Ortner, P. B., E. M. Hulbert and P. H. Wiebe. Phytohydrography and herbivore habitat contrasts in the Northwestern Atlantic Ocean. Being revised for re-submission to Deep-Sea Research.

Others

- 1976 Wiebe, P. H. and P. Ortner. Biological evidence supporting the advective character of cold-core rings. Polymode News 8, 3 and 6. Unpublished manuscript.
- 1977 Richardson, P., J. Schmitz and P. H. Wiebe. Gulf Stream Ring Experiment. Polymode News 25, 3. Unpublished manuscript.
- 1977 Wiebe, P. H. and D. W. Spencer [eds.]. Oceanographic study of warm core Gulf Stream rings and the Northwest Atlantic Slope Water region. A prospectus for multidisciplinary research. A report of a May 1977 Workshop on Warm Core Rings. Submitted to I.D.O.E., 110 pp.

PETER H. WIEBE
Biologist
Associate Scientist
[REDACTED]

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B.S., 1962, North Arizona University
Ph.D., 1968, University of California

Research Assistant, Scripps Institution of Oceanography, 1962-68
Postdoctoral Fellow, Hopkins Marine Station, Stanford University,
1968-69

Temporary Assistant Professor, Oregon State University,
July-August, 1969
Assistant Scientist, Woods Hole Oceanographic Institution,
1969-74
Associate Scientist, Woods Hole Oceanographic Institution,
1974-present

TIMOTHY J. COWLES
Biologist
Postdoctoral Fellow

[REDACTED]
B.S., 1973, Stanford University
A.M., 1973, Stanford University
Ph.D., 1977, Duke University

Research Assistant, 1972-73, Stanford University
Teaching Assistant, 1973-74, Duke University
Research Assistant, 1974-77, Duke University
Postdoctoral Scholar, 1977-present, Woods Hole Oceanographic
Institution

Recent Pertinent Publications

1977 Cowles, T. J., R. T. Barber and O. Guillen. Biological consequences of the 1975 El Niño. *Science* 195: 285-287.

1977 Cowles, T. J. Copepod feeding in the Peru upwelling system. Ph.D. Thesis, Duke University, Durham, N.C. 173 pp.

In Press

Cowles, T. J. (Associate Editor) *El Niño Watch Atlas of Physical, Chemical, and Biological Oceanographic and Meteorological Data*. William C. Patzert [ed.], Norpax. 1978.

In Manuscript

Cowles, T. J. The feeding response of copepods from the Peru upwelling system. I. Low food levels and the threshold response. Submitted to *J. Mar. Res.*

Cowles, T. J. The feeding response of copepods from the Peru upwelling system. II. Food size selection. Submitted to *J. Mar. Res.*

Current Support and Pending Applications for Principal Investigator

Contracts and Grants

<u>Title</u>	<u>Number</u>	<u>Months of Effort</u>	<u>Dollar Amount</u>	<u>Dates</u>
The Biology of Gulf Stream Cold Core Rings	ONR N00014-74-0262 NR 083-004	7	\$ 84,000	January 1, 1978 to December 31, 1978
The Spatial Structure of Marine Zooplankton Communities	NSF OCE 77-09132	3	73,500	May 1, 1977 to October 31, 1979
The Physical and Biological Oceanography of Plankton Patchiness and Internal Wave Intermittency of Massachusetts Bay	NSF OCE 77-08682	1	173,000	May 1, 1977 to October 31, 1978
Patterns and Processes in the Physics and Biology of the Northern Sargasso Sea in Spring 1979	NSF OCE 78-20055	9	439,578	Proposed November, 1978 February 28, 1979
Education Program	Woods Hole Oceanographic Institution	2		January 1, 1978 to December 31, 1978
Workshop for Oceanographic Study of Warm Core Gulf Stream Rings and the Northwest Atlantic Slope Water Region	NSF-IDOE	0	15,761	October 1, 1978 to September 30, 1979

Historical Funding in Support of Program

A. The principal investigator had five months' support during the period 1 April 1977 to 31 December 1977 from the Office of Naval Research, ONR N00014-74-CO 262 083-004 "The Biology of Gulf Stream Cold Core Rings" - \$216,313.

B. The principal investigator had 1 month's support during the period 1 January 1976 to 31 December 1976 from the Office of Naval Research, ONR N000-74-CO 262 NR 083-004 "The Biology of Gulf Stream Cold Core Rings" - \$40,785 and supplement - \$19,997. For the extension period of this contract - 1 January to 31 March 1977, the amount was \$19,557 and this provided 3 months' support for the principal investigator.

C. The principal investigator had 3 months' support during the period 1 January 1975 to 31 December 1975 from the Office of Naval Research, ONR N000-14-66-C0262 NR 083-004, "The Biology of Gulf Stream Cold Core Rings - \$52,618.

D. Funding by ONR for the study of the biology of the Gulf Stream Cold Core Rings began in 1974. For calendar year 1974 the amount of the contract was \$11,200.

MESOPELAGIC FISHES IN COLD-CORE GULF STREAM RINGS

Richard H. Backus
Soc. Sec. No. 131-16-725
(617) 548-1400, Ext. 300

Publications of Past Two Years for the Principal Investigator

1976 Jahn, A. E. and R. H. Backus. On the mesopelagic fish faunas of Slope Water, Gulf Stream, and Northern Sargasso Sea. Deep-Sea Res. 23: 223-234.

1977 Backus, R. H. and J. E. Craddock. Pelagic faunal provinces and sound-scattering levels in the Atlantic Ocean. In: Oceanic sound scattering prediction, N. R. Andersen and B. J. Zahuranec [eds.], Marine Science 5: 529-547. Plenum Press.

1977 Backus, R. H., J. E. Craddock, R. L. Haedrich and B. H. Robison. Atlantic mesopelagic zoogeography. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1, pt. 7: 266-287.

1977 Nafpaktitis, B. H., R. H. Backus, J. E. Craddock, R. L. Haedrich, B. H. Robison and C. Karnella. Family Myctophidae. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1, pt. 7: 13-265.

Curriculum Vitae

RICHARD H. BACKUS
Biologist
Senior Scientist
Woods Hole Oceanographic Institution

[PII Redacted]

A.B., 1947, Dartmouth College
M.S., 1948, Cornell University
Ph.D., 1953, Cornell University

Research Associate, Woods Hole Oceanographic Institution,
1952-59
Marine Biologist, Woods Hole Oceanographic Institution,
1959-63
Chairman, Biology Department, Woods Hole Oceanographic Institution, 1970-74
Associate in Ichthyology, Harvard University, 1960-present
Senior Scientist, Woods Hole Oceanographic Institution, 1963-present

JAMES E. CRADDOCK
Biologist
Research Specialist
Woods Hole Oceanographic Institution

[PII Redacted] [REDACTED]

A.B., 1958, University of Louisville
Ph.D., 1965, University of Louisville

Ford Foundation Postdoctoral Fellow, 1965
Assistant Scientist, Woods Hole Oceanographic Institution,
1966-70
Research Associate, Woods Hole Oceanographic Institution,
1970-74
Research Specialist, Woods Hole Oceanographic Institution,
1974-present

Publications of Past Two Years

1977 Backus, R. H. and J. E. Craddock. Pelagic faunal provinces and sound-scattering levels in the Atlantic Ocean. In: Oceanic sound-scattering prediction, N. R. Andersen and B. J. Zahuranec [eds.], Marine Science, 5: 529-547.

1977 Backus, R. H., J. E. Craddock, R. L. Haedrich and B. H. Robison. Atlantic mesopelagic zoogeography. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1, pt. 7: 266-287.

1977 Nafpaktitis, B. H., R. H. Backus, J. E. Craddock, R. L. Haedrich, B. H. Robison and C. Karnella. Family Myctophidae. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1, pt. 7: 13-265.

Current and Pending Support

For the period 1 January - 31 December 1978, \$35,000 of ONR funds were made available for continuing the rings fish work. This principally covers salaries for R. H. Backus and J. E. Craddock for 4 1/2 months.

The investigators have a grant ("Mesopelagic fishes in the Florida Current") from the National Science Foundation for \$133,000, covering the period 1 October 1977 - 30 September 1979. It provides for 10 months' support each for R. H. Backus and J. E. Craddock over the two year period.

Other recent ONR support was about \$11,000 for the period 1 April - 31 December 1977 for the study of "natural operating areas", the interrelations or identity of physical, zoogeographical and sound-scattering domains in the oceans. These funds were expended in November and December, 1977.